

CIO

JUNE 15, 1992
VOLUME FIVE NUMBER FOURTEEN
SEVEN DOLLARS

THE MAGAZINE FOR INFORMATION EXECUTIVES

SPECIAL SECTION

STRATEGIC OUTLOOK ON JUSTIFYING TECHNOLOGY:

*CIOs Inch Toward
New Ways of Valuing
IT's Contributions*

AN INTERNATIONAL DATA GROUP PUBLICATION

Cincinnati Bell Telephone's
Ralph Renneker

If making all your computers and applications work together were as simple as hooking up another device or introducing a new technology, you would have done it by now.

But true systems integration isn't that simple. Because it takes more than technology to make it happen. It takes people as well.

People who understand your business. People who understand how integrating a multi-vendor solution can affect your business. People who can advise you, consult with you, even train your users on multiple vendors' systems.

Digital has such people. Over 40,000 of them, actually. A global support and

service group capable of solving all your systems integration problems.

Which means no matter how large your company or how small your work group, we can do everything from manage your multi-vendor solution to provide a single point of contact throughout every stage of a systems



N A S F R O M D I G I T A L

© DIGITAL EQUIPMENT CORPORATION 1991. THE DIGITAL LOGO IS A TRADEMARK OF DIGITAL EQUIPMENT CORPORATION.

DIGITAL OPENS THE WAY TO SYSTEMS INTEGRATION.

integration program.

We've been doing so for more than a decade. Supporting multi-vendor networked solutions for hundreds of companies all over the world, while integrating over 8000 hardware and software products from more than 800 different vendors.

Concurrently, we've taken a leadership role in all the major standards bodies

and consortia, helping to develop such widely accepted standards as Motif®, OSF®/DCE, X.400, IEEE/POSIX, OSI and scores of others. One result of which is our Network Application Support (NAS), which can help you build open, multi-vendor networks with true application interoperability across different platforms and operating environments.

Another result is the new and widely heralded Advanced Computing Environment (ACE) initiative. Destined to solve the software compatibility problems between RISC and x.86 products.

All of which means if you've got the will, Digital has the way to integrate all of your systems. To find out more, talk to a Digital **digital**™ representative.

THE OPEN ADVANTAGE.

MOTIF AND OSF ARE REGISTERED TRADEMARKS OF THE OPEN SOFTWARE FOUNDATION.



No Fences. No Boundaries. No Limits. That's The Freedom Of CA90s.

The freedom to choose the best applications without worrying about hardware constraints.

The freedom to right-size your entire computing environment with the best mix of hardware platforms.

And the freedom to integrate and automate all your applications across the many proprietary, closed environments you face today. It's all there inside the most comprehensive architecture ever developed: CA90s.

The only architecture that supports every major hardware platform including IBM, Digital, Hewlett-Packard,



Apple, Fujitsu, Bull, Data General, Tandem and Hitachi. All the major operating systems: MVS, VSE, VM, VMS, UNIX, APPLE, WINDOWS, DOS and OS/2.

And the world's broadest range of integrated software solutions, covering systems management, information management and business applications.

If you're tired of being fenced in, call 1-800-CALL CAI for complete information on CA90s.

The architecture that can set you free.

**COMPUTER
ASSOCIATES**
Software superior by design.

© Computer Associates International, Inc. One Computer Associates Plaza, Islandia, NY 11788-7000. All product names referenced herein are trademarks of their respective companies.

CIO

VOLUME 5, NUMBER 14

STRATEGIC OUTLOOK

JUSTIFYING TECHNOLOGY

The Measure Hunt

Hard times call for hard numbers, and senior executives are demanding that CIOs produce measures in stone rather than sand when justifying and prioritizing IT projects.

By Thomas Kiely

59

Many Happy Returns

Suppose you could subject your organization's IT investment opportunities to an orderly justification process in which each was evaluated by its probable contribution to key business objectives? Wouldn't that make everyone happy?

By Richard Pastore

66



*A ruling class 66
Cover photo by Jack Van Antwerp*

The Users' New Clothes

Gauging the business value of systems without input from users is like making a suit of clothes for someone who never shows up for a fitting. But establishing an IS-customer partnership may call for some alterations to the organization.

By Thomas Kiely

76

Not Measuring Up

Our survey of CIOs shows epidemic levels of displeasure with their organizations' justification programs.

By Dudley P. Cooke and Edward B. Parrish

84

FEATURES

Big WAN on Campus

The pervasive use of computers and communications technology at Drew University has turned it into a showcase for education in the future. It has also boosted enrollment and strengthened Drew's position in a competitive market.

By Megan Santosus

38

*An IT League
school 38*



M O R E ► ► ►

Born In



Bell Labs

*Or, How AT&T Bell Labs Conceives Some Of
The Best Ideas In Communications.*

AT&T Bell Laboratories. It's a new kind of phone that knows who you're calling. A switch that harnesses the power of light. It's 4,000 Ph.D.s. Seven Nobel Prizes. A new technology that integrates voice. Data. And images. "A patent a day." Advanced technologies like broadband. SONET. Photonics. Discover how AT&T Network Systems and your local telco are using these technologies to make your public switched network the fastest, most reliable, easiest-to-use network in the world. Discover visions of the future. And ways to evolve from the past. Unique solutions conceived by Bell Labs. And only available by calling AT&T Network Systems or your local telephone company.

*AT&T And Your Local Phone Company
Technologies For The Real World.*



AT&T

Network Systems

NOW THIS IS WHAT WE CALL DOWNSIZING!



Goodbye ol' mainframe computer! Industry leaders have already decided: They're going to faster/smaller/less expensive computers based on open systems standards. And Data General is leading the way! Our AViiON® Systems can give you 117 MIPS of mainframe power that fits in a pizza box for a downsized starting price of under \$100,000!

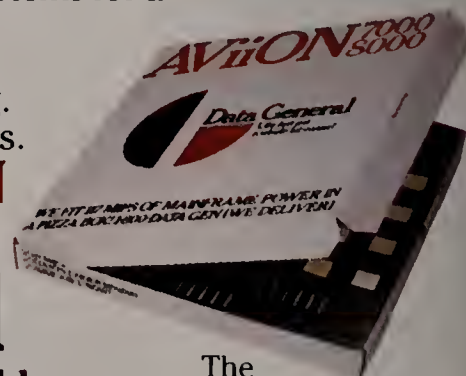
Unbelievable, you say? Believe it, we say! Here's what AViiON can mean to your business:

- Increased savings because AViiON costs millions less than traditional mainframes—plus you save on maintenance, software, power, etc.
- Increased productivity because AViiON allows your different computers to work together as a corporate resource.

- Increased information storage capacity and security thanks to the availability of AViiON's fault tolerant disk array.
- Increased and immediate "mainframe class" performance using the leading databases, business applications and communications software.
- Increased envy from your competitors because you took advantage of open systems for a competitive edge.

Data General AViiON Systems.
That's where the world is going.
And we want to take you with us.
Call **1-800-DATA GEN**

Data General
Where the World
is going!



The
AViiON System.
Mainframe
power that fits
in a pizza box
and saves you
millions!

FEATURES (continued)

Six Months of CIO

An index of all the major articles published in *CIO* magazine in the first half of 1992, including a cross-reference by article type.

88



Worlds within worlds 94

COLUMNS

INSIGHTS: GETTING THE MESSAGE

As business alliances become more complex and interconnected, CIOs must concern themselves not only with the transmission media handling the increased flow of data but with the quality of the information being sent as well.

By Daniel S. Appleton

32

HUMAN FACTORS: STUDENT TEACHERS

The Odyssey of the Mind program, which fosters creativity in children, has shown one information executive that you can learn a lot from your kids—including how to enhance an IS team's performance.

By Thomas M. Mauro

90

STATE OF THE ART: VIRTUAL CAPITALISTS

Despite its blue-sky reputation, down-to-earth companies are putting real money into virtual reality. Look for some promising, and potentially profitable, commercial applications to take root.

By Alice LaPlante

94



The mouths of babes 90

DEPARTMENTS

Editor's Letter 8

Publisher's Letter 21

Trendlines 22

- ▶ Online dissection
- ▶ Crisis management
- ▶ A virtual experience
- ▶ CIO survey
- ▶ LAN test center
- ▶ Family-tree software

- ▶ Robot competition
- ▶ Typing software buyers
- ▶ Image retrieval
- ▶ Emergency-call system
- ▶ Searching misspelled names

FYI 98

Index 99

Off the Shelf 100



Understanding relativity 22

© By CIO Publishing Inc.

Our Strategic Outlook this month, "The Burden of Proof," beginning on Page 59, examines some of the emerging methods compa-

CIO magazine and the Executive Insight Group surveyed some 160 readers to determine their approaches to quantifying systems' benefits. Among other things, our survey revealed that CIOs are not proactive enough in seeking out effective methods (the results are reported on Page 84). This may be one of the reasons they are not invited to join the inner circles of strategic planning.

Whatever approach a company chooses, customer involvement is essential to the creation of any meaningful schema for justifying systems and measuring their benefits. CIOs admit that this vital piece of the process is not yet in place.

Marcia Furental

VP/GM, Executive Programs LYNDA ROSENTHAL
Executive Program Manager WALTER MANNINEN

Contributing Art/Editorial Assistant Margaret Thom

Editorial Offices CIO Publishing Inc., 492 Old Connecticut Path, P.O. Box 9208, Framingham, Mass. 01701-9208 (508) 872-8200. **Subscriber Services** (800) 788-4605.

International Data Group

Board Chairman	PATRICK J. MCGOVERN
President	WALTER BOYD
Executive Vice President	WILLIAM P. MURPHY

CIO is a publication of International Data Group, the world's largest publisher of computer-related information and the leading global provider of information services on information technology. International Data Group publishes over 178 computer publications in more than 55 countries. Thirty million people read one or more International Data Group publications each month. International Data Group's publications include: **ARGENTINA'S** Computerworld Argentina, InfoWorld Argentina; **ASIA'S** Computerworld Hong Kong, Computerworld Southeast Asia, Computerworld Malaysia; **AUSTRALIA'S** Computerworld Australia, Australian PC World, Australian Macworld, Profit, Information Decisions, Reseller; **AUSTRIA'S** Computerwelt Österreich; **BRAZIL'S** DataNews, Mundo IBM, Mundo Unix, PC Mundo, Publish; **BULGARIA'S** Computerworld Bulgaria, EDIworld, PC World Express; **CANADA'S** Direct Access, Graduate Computerworld, InfoCanada, Network World Canada; **CHILE'S** Computerworld, Informatica; **COLOMBIA'S** Computerworld Colombia; **CZECHOSLOVAKIA'S** Computerworld Czechoslovakia, PC World Czechoslovakia; **DENMARK'S** CAD/CAM WORLD, Communications World, Computerworld Danmark, Computerworld Focus, Computerworld Uddannelsen, LAN World, LOTUS World, Macintosh Produktkatalog, Macworld Danmark, PC World Danmark, PC World Produktguide, Windows World; **ECUADOR'S** PC World; **EGYPT'S** PC World Middle East; **FINLAND'S** Mikro PC, Tietoviikko, Tietoverko; **FRANCE'S** Computer Direct, Distributique, GOLDEN MAC, InfoPC, Languages & Systems, Le Guide du Monde Informatique, Le Monde Informatique, Telecoms & Réseaux International; **GERMANY'S** Computerwoche, Computerwoche Focus, Computerwoche Extra, Computerwoche Karriere, edv aspekte, Information Management, Lotus Welt, Macwelt, Netzwerk, PC Welt, PC Woche, Publish, Unit, Unix Welt; **GREECE'S** InfoWorld, PC Games, PC World Greece; **HUNGARY'S** Computerworld SZT, Mikrovilág Magazin, PC World; **INDIA'S** Computers & Communications; **ISRAEL'S** Computerworld Israel, PC World Israel; **ITALY'S** Computerworld Italia, Macworld Italia, Networking Italia, PC World Italia; **JAPAN'S** Computerworld Japan, Macworld Japan, SunWorld Japan; **KENYA'S** East African Computer News; **KOREA'S** Computerworld Korea, Macworld Korea, PC World Korea; **MEXICO'S** Compu Edición, Compu Manufactura, Computación/Punto de Venta, Computerworld Mexico, MacWorld, Mundo Unix, PC Journal, Windows; **THE NETHERLANDS'** Computer! Totaal, Computerworld Netherlands, LAN Magazine, MacWorld; **NEW ZEALAND'S** Computer Listings, Computerworld New Zealand, New Zealand PC World; **NIGERIA'S** PC World Africa; **NORWAY'S** Computerworld Norge, C/world, Lotusworld Norge, Macworld Norge, Network, PC World Ekspres, PC World Norge, PC World's Product Guide, Publish World, Student Guiden, Unix World, Windowsworld; iDG Direct Response; **PERU'S** PC World; **PEOPLE'S REPUBLIC OF CHINA** China Computerworld, TECH Newproductworld; **PHILIPPINES'** Computerworld, PC World; **POLAND'S** Computerworld Poland, Komputer; **ROMANIA'S** Infoclub Magazine; **RUSSIA'S** Computerworld-Moscow, PC World, Networks; **SPAIN'S** Amiga World, Autocadicon, CIMWorld, Computerworld Espana, Comunicaciones World, Macworld Espana, PC World Espana, Publish; **SWEDEN'S** Affarekonomi Management, Attack, CAD/CAM World, ComputerSweden, Digital Världen, Lokala Nätverk/LAN, Lotus World, MAC&PC, Macworld, Mikrodatorn, PC World, Publishing & Design (CAP), Unix/Opna system, Dataingenjören, Maxi Data Windows; **SWITZERLAND'S** Computerworld Schweiz, Macworld Schweiz, PC & Workstation; **TAIWAN'S** Computerworld Taiwan, PC World Taiwan; **THAILAND'S** Thai Computerworld; **TURKEY'S** Computerworld Monitor, Macworld Türkiye, PC World Türkiye; **UNITED KINGDOM'S** Lotus Magazine, Macworld; **UNITED STATES'** AmigaWorld, Cable in the Classroom, CIO, Computer Buying World, Computerworld, Digital News, DOS Resource Guide, Electronic News, Federal Computer Week, GamePro, inCider/A+, iDG Books, InfoWorld, Lotus, Macworld, Momentum, MPC World, Network World, NeXTWORLD, PC Games, PC World, PC Letter, Publish, RUN, SunWorld, SWATPro; **VENEZUELA'S** Computerworld Venezuela, MicroComputerworld Venezuela; **YUGOSLAVIA'S** Moi Mikro



**PEOPLE IN THE
COMPUTER BUSINESS
HAVE BEEN TRYING
TO IMPROVE ON
COMPAQ FOR YEARS.**

GUESS WHO F

It wasn't easy. Changing a company our size never is. But we listened to our customers, we studied our competitors, we took a long look in the corporate mirror. Then we did the only thing we know how to do. We rolled up our sleeves and went to work.

that stretch the envelope of technology at prices that our customers will find compelling and our competition should find, well, competitive.

What you won't see are stamped-out, second-rate products with the COMPAQ name stuck on at the end of somebody else's assembly line.

While that may be the way of the world, it's not the COMPAQ way.

We've always believed that the performance, compatibility, reliability, and actual affordability of a computer has more to do with innovation than with imitation.

So instead of asking



The result of all this distribution and, naturally, new products. Everything from inexpensive machines for basic computing needs, to advanced products

NALLY Did It?

1200 of the world's finest computer engineers to forget all they knew about building great computers, we asked them to take all they knew and build great inexpensive computers.

Engineering to cost vs. engineering at any cost.

And as the best engineers do, they saw this not as a limitation, but as a challenge. A hurdle to overcome. A problem to ponder, twist, push, pull and ultimately solve.

They questioned manufacturing techniques, they challenged our suppliers, they turned every aspect of every process upside down, inside out

and sideways until they had managed to shake out every unnecessary cost or component.

No more over-think.

No technology simply for the sake of new technology.

And along the way to our new and improved destination, we learned a little something.

We learned that what makes a COMPAQ PC more than just another computer isn't simply the engineering. Or design. Or component quality. Or product testing.

It's not just the more tangible things such as compatibility or near-zero defect production

or the dozens of other examples you'll be discovering for yourself on the following nine pages of this advertisement.

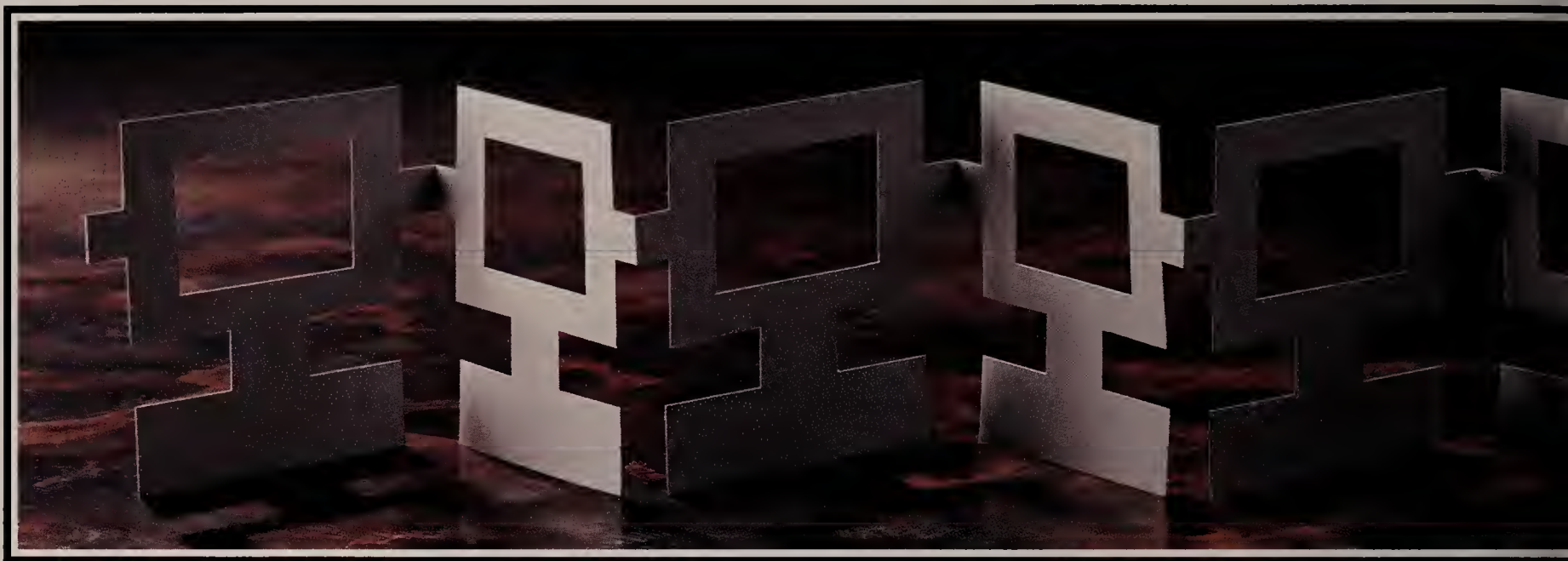
When all is said and done, what truly makes a COMPAQ PC far more than simply another computer is simply passion.

The passion to push technology, the passion to recognize the idea whose time has come, the passion to listen and learn and adapt to whatever our customers may want today while anticipating what they might need tomorrow.

In other words, the passion to do things right for the customer.



AT MOST COMPUTE STANDS FOR REPLIC



It's hard to believe, but at some PC companies the engineering department is nowhere to be found. Which stands to reason, since most other computers aren't engineered, they're copied. And, as with all copies, something is frequently lost in the translation.

What happens when companies lack the engineering depth to make new things happen? You guessed it...new things don't happen.

A fact few understand better than the 1200-plus engineers at Compaq.

The same engineers who developed the first portable computer with dual-mode monitor and an industry standard for compatibility. And the world's first desktop PC with concurrent bus.

The same engineers

who designed and delivered the first 386 PC. And managed to break the 32-MB barrier in hard-drive technology.

Just for starters.

So what have we been up to lately?

Among other things,

R COMPANIES, R&D ATE AND DUPLICATE.



we just introduced the world's first lightweight 386SL/25 notebook PC with 120-MB hard drive and full desktop expansion capability.

Our engineers have developed sophisticated Windows accelerators, and conducted extensive research and testing to optimize Windows 3.1 performance on every COMPAQ computer. A test other companies will

no doubt leave you to perform on your own.

We've even been designing enhanced fault-tolerance features into our drive array adapters to make data reconstruction and retrieval easier, more automatic and far less disruptive to everyday operation.

As you read this, we're working on dozens of new computing ideas.

Some will arrive next

week. Some next year.

Some may change the way you look at computers forever. Others will simply make next year's COMPAQ products work a little better.

And finally, some will be just the kind of ideas our competitors have been looking for.

Ideas that wouldn't occur to them, however, until they looked inside a COMPAQ PC.



VARIETY MAY BE BUT TO A COMPUTER THE KISS

If you've ever attempted to put together a PC network, even one that's relatively simple, you know just what we mean. It can be time consuming. Nerve wracking. Sometimes even traumatic. And that's when everything goes according to plan.

Now obviously, variety is a fact of life when dealing with networks. There's probably not a single LAN that doesn't include a few PCs from one manufacturer, some more from another, and still more from a third. (Not to mention a vast assortment of peripherals, interface cards and operating systems.)

And, being a leading proponent of PC technology, we're certainly

not suggesting that you scrap all your hardware and start from scratch with strictly COMPAQ products.

We do recommend, however, that as your needs expand, you think a little differently about how you approach your next PC purchase.

Because, as you may have noticed, when you put bargain-basement variety components together and subject them

to the increasingly complex demands of today's computer network environments, compatibility problems arise.

It's like being at a bad cocktail party. Nobody talking to anybody and



everybody blaming the one who brought them all together.

And suddenly you find your well-thought-out, master-minded PC network has turned into a house of cards hit by a

THE SPICE OF LIFE, NETWORK, IT COULD BE OF DEATH.

rather stiff breeze.

On the other hand,
there's Compaq.

Unlike other comput-
er companies, we have an
entire group of engineers
who are dedicated exclu-
sively to testing network

environments. Working

with the world's major
software companies like

Novell, Banyan, SCO,
Microsoft, and others,

they test all COMPAQ
products in very active,

multi-user environments

network installations.

As a result, you can
be assured you're getting
products designed, engi-
neered and thoroughly
tested to operate within
the most complicated
network environments.



and communication hard-
ware and software.

In addition, we have
teams of engineers who
continually monitor the
everyday performance of
all COMPAQ computers
within various network

for hours, days and even
months on end.

To make integration
easier, we offer COMPAQ
TechNotes and ToolKits,
the most sought-after
guides in the computer
industry for multi-vendor

In short, products built
by a company dedicated
to solving potential PC
network integration prob-
lems in our offices.

That way you don't
end up having to solve
them in yours.



WHAT YOU DO WITH A CO THE FACT THAT YOU MIGH

Not too long ago, Denise Anderson of Morrison, Colorado, left her COMPAQ notebook PC in, of all places, her driveway. When next seen, the 6.9-pound computer had become a speed bump for 1.3 tons of automobile. When next used, it started up just fine.

Now, that may have been a bit surprising to Denise, but at Compaq, the engineering department didn't so much as raise an eyebrow.

After all, when a PC is designed to withstand

the slings and arrows of today's business world, a small thing like a minor traffic mishap is all in a day's work.

If you walked into the Compaq testing laboratories, what you'd see

is a computer owner's worst nightmare.

Computers subjected to the kinds of conditions you would only encounter during the height of summer in the Sahara. Or midnight in an Arctic winter.

Humidity, temperature, power-cycling and thermal-shock tests performed while the unit is up and running, not just



COMPUTER IS YOUR BUSINESS. IT ACTUALLY DO IT IS OURS.

for a few hours, but for days and weeks to simulate years of normal use.

Keyboards that are pounded and punched millions of times, often with dust, dirt, ashes and other kinds of contaminants dumped into their workings.

Portable computers being opened and closed up to 20,000 times to ensure the integrity of the hinges. And dropped over and over again from terrifying heights, right onto their most vulnerable corners.

Just to make sure that your notebook PC can survive a couple of unattended hours stuck in

the trunk of your car. Or the power surges of your electrical system. Or even an occasional heavy-handed operator.

But the important part of the story isn't simply that we put our products through one of the most rigorous testing programs in the entire computer industry.

The important part is they survive it.

That means reliability and serviceability are designed into the products, not added on as an afterthought.

It means thermal simulations to determine the best locations for components and cooling

devices. And electrostatic discharge protection integrated into the system from the start.

It means consistency of component quality from one production run to the next. And to the one after that.

It means, quite simply, that the ultimate goal of every Compaq engineer is to design a product that works, and keeps on working, no matter what.

A product, in other words, that won't break down under the pressures of today's complex business world.

Even when the pressures come to 1.3 tons.



FOR SERVICE AND SUPPORT ARE NOT STANDING

With our new service and support program, what you need is what you get. In fact, our technical support staff resolves 95% of all calls in under 15 minutes. And for questions that require greater expertise, we have engineers ready to get on the line.

All of which is just part of CompaqCare, a comprehensive new program designed to provide you with everything you may need when it comes to service and support. Quickly and easily.

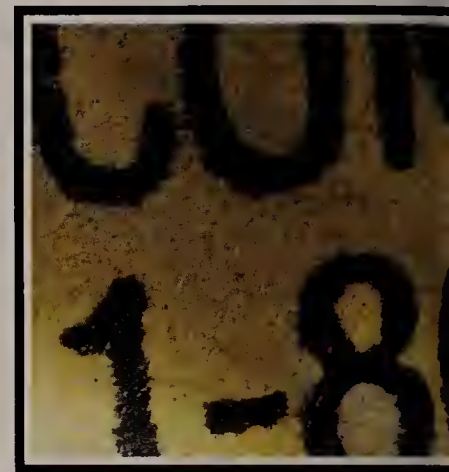
Our free on-site* one-year, limited warranty, for instance, will cover practically anything that could happen to any of your COMPAQ hardware, anywhere it occurs in the U.S.A. or Canada.

And, unlike most of our

competitors' programs, the new Compaq on-site warranty covers every product we build.

And no matter where you take COMPAQ portable or notebook PCs, they're also backed by a worldwide, one-year, carry-in warranty.

So wherever business takes you—from Tokyo to Turkey, Britain to Berlin—you can feel perfectly comfortable taking your COMPAQ portable along with you.



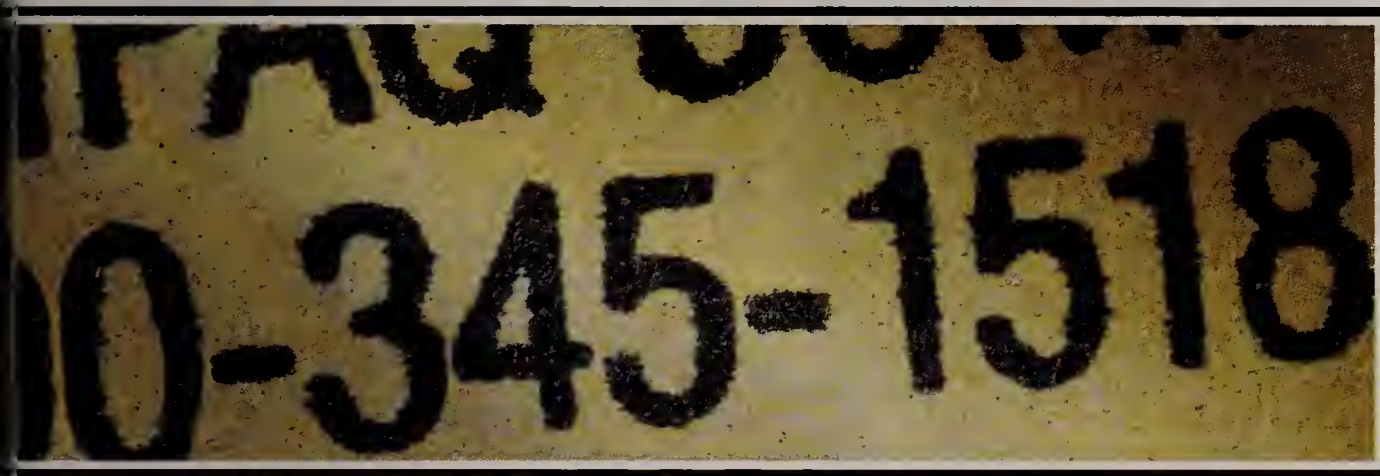
We also give users the flexibility to choose from over 2,000 Authorized COMPAQ Reseller service locations.

Or you can call on us directly for service.

For companies with technicians already on board, we offer a self-maintainer program that gives you access to all the support resources you need to perform whatever service you may find necessary.

And, of course, while

RT, JUST CALL. OPERATORS BY. ENGINEERS ARE.



increasing the scope of our warranty programs has certainly been our priority, we've also been working on many other important aspects of customer support.

Whenever you have questions, for example, the Compaq SMART System provides all our support personnel with a sophisticated information bank comprised of thousands of hours of troubleshooting and engineering expertise.

Which means the person who answers your call is certain to supply you with consistent, smart answers to all of your questions. And take care of even your most pressing problem. We even have on-line access with most of the major software companies to help you quickly take care of those software-related difficulties that you may encounter.

You'll also gain 24-hour electronic support

through three different services: CompuServe, PAQFax, and QuickFind, our CD-ROM technical reference library.

If, after all of the above, you're still not quite convinced that our new service and support program is one of the most comprehensive in the industry, call us on it.

1-800-345-1518.

On the other end of the phone, you'll find a whole bunch of people looking for trouble.



A THOUGHT FOR THOSE WHO APPRECIATE THE VALUE OF A DOLLAR AS WELL AS THE VALUE OF A COMPAQ.

"Now that we've made clear all the things that Compaq stands for, let us make it clear what we won't stand for anymore. High prices. We have a new mission. A new goal.

To provide you with Compaq quality, Compaq research and development, Compaq reliability and testing and service and support at the most competitive prices possible.

In other words, products that are exactly what you need, easy to find, and priced right.

That's what Compaq is all about today.

For the details on all of

the above, yes even the prices, give us a call at 1-800-345-1518, Ext. 205, in the U.S., 1-800-263-5868, Ext. 205, in Canada.

We think you'll like what we have to say."

—Eckhard Pfeiffer

President, CEO

Compaq Computer

Corporation



*This service is provided by contracted Service Providers and may not be available in certain geographic locations. Contact the Compaq Customer Support Center for further details. © 1992 Compaq Computer Corporation. All Rights Reserved. Printed in the U.S.A. COMPAQ, DESKPRO, SYSTEMPRO Registered U.S. Patent and Trademark Office. QuickFind, PAQFax and CompaqCare are trademarks of Compaq Computer Corporation.

Coming In CIO

A Mature User

Its membership may be getting on in years, but the American Association of Retired Persons isn't lacking in young, exciting technologies. The largest membership organization in the country makes shrewd use of its substantial technical resources to support both aggressive lobbying activities and ambitious service programs.

Face to Interface

A graphical user interface is a medium for communication between human beings and computers. It may be colorful—it may even display a sense of humor—but it is not a toy. GUI design, say experts, merits as much care and attention as the underlying application.

Buying the IS Group

Faced with a mandate to reduce IS costs by at least 20 percent, glassmaker Libbey-Owens-Ford sold its IS shop to its own IS director—who then turned around and signed up Libbey as his first outsourcing customer.

The CIO 100

Once again we've devised a completely new and relevant set of criteria for judging our best of breed. Look for more details in your next issue of CIO.

LETTER FROM THE PUBLISHER



What is the best way to measure IT's return on investment? What specific parameters—tangible and intangible—can be established within the organization to monitor the effectiveness of technology investments? How can CIOs redirect the attention of senior executives from an exclusive focus on traditional financial measures toward softer but equally important factors, such as increased customer satisfaction

and improved customer retention?

As reported in this issue of *CIO*, a growing number of innovative approaches to measuring the ROI of IT are beginning to emerge. But, despite great progress, many CIOs are still struggling to find and sell internally a formula that effectively strikes a balance between hard and soft measures.

Given the pressure on CIOs to both justify and prove the benefits of technology investments, it is critical to share new information on this topic. Theories and real-life experiences of IS executives, academics, vendors and consultants, such as those featured in this month's Strategic Outlook section, can help CIOs find the solution most appropriate to their own organizations. This, in turn, will ensure that investments in new technologies and related services continue.

Wayne L. Woz

P.S. Registration is well underway for the next CIO Perspectives Conference, "The Process of IT: Organizing for Success," to be held Oct. 11-14 at the Boca Raton Resort & Club. Additional information is available by calling our toll-free registration center at 800 366-0246. We look forward to seeing you there!

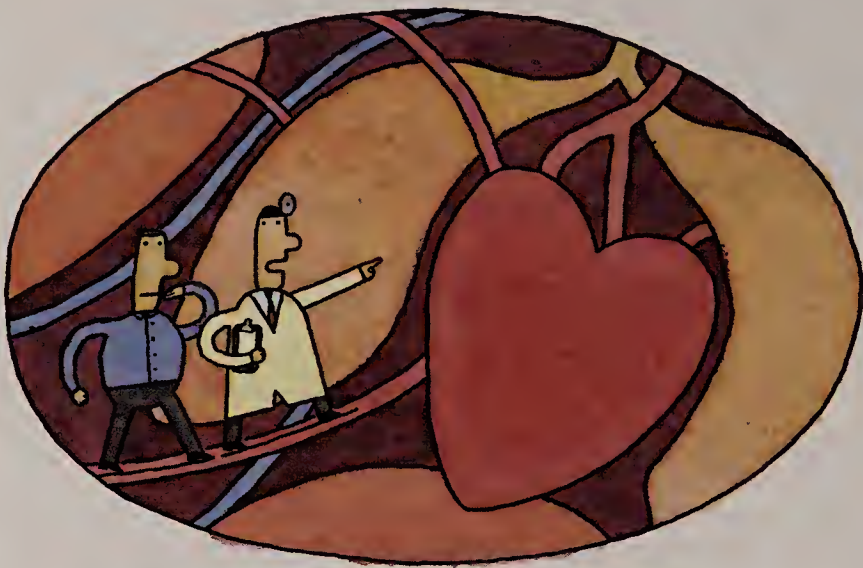
TRENDLINES

ANATOMICAL SOFTWARE

BARE-BONES COMPUTING

Computers have always been used to manage our body of knowledge; now they are doing the same for our knowledge of the body.

Like its namesake, A.D.A.M. (Animated Dissection of Anatomy for Medicine) is the first of its kind. The program allows users to visually peel



A FUGITIVE, BY ANY OTHER NAME

Searching huge databases for records attached to misspelled names is probably more fun than watching a traffic light change, but not much more. In Massachusetts, though, the lights change quickly for investigators searching a database of crooks on the lam.

In 1987 the Commonwealth installed a name-search software product, called SSA-Name, on the Unisys mainframe that holds over 200,000 records of wanted criminals and missing persons. The product, sold by Search Software America, in Greenwich, Conn., creates a list of possible matches for a variety of misspellings, slang names, and partial names—such as Wood, Wod, Woode and Woody. Moreover, SSA-Name is easy to use and easy to program, according to Martin Censullo, database manager for the Commonwealth's Criminal History Systems Board.

Nine other states and several companies also use SSA-Name. Georgia employs the product as a search mechanism for its tax-collection agency and in the secretary of state's office. IT staff familiar with both Georgia systems say SSA-Name works well—but caution that its effectiveness depends upon a well-planned edit table. Programmers need a clear understanding of how SSA-Name searches the database in order to accurately define how the system will ship words to the screen and prioritize them. Also, Search Software America's parent company is in Australia—and the Bay State's Censullo says his technical support came from Crocodile Dundee's island. ■

away layer after layer of skin from a highly detailed anatomical diagram, performing what are, in effect, on-screen dissections.

A scalpel tool simulates the incision, slicing through multiple layers of tissue to reveal the structures beneath. Users can select any nerve, muscle, vessel or structure and link it to any other part, to text elements, or to X-rays and other visuals.

The product's creator, A.D.A.M. Software of Atlanta, envisions the program being used by medical students as a learning tool and by physicians as a way to improve communication with their patients. "This program may become the 21st century's answer to *Gray's Anatomy*," said A.D.A.M. President Gregory Swayne. Several medical schools are already using A.D.A.M. as a supplement to their work on real cadavers.

And doctors are beginning to include A.D.A.M. in their treatment plans, using the software to explain complex medical conditions to their patients and to demonstrate possible courses of treatment. Swayne said this type of enhanced dialogue could "result in fewer doctors getting sued, which could lower medical costs." At least one insurance company is offering discounts to physicians who purchase the software.

A.D.A.M., which is available in both IBM-compatible and Macintosh versions, lists for about \$3,500 depending on configuration. Also available is A.D.A.M. Studio, which allows users to customize the diagrams—by enlarging an organ, say, or color-keying a specific group of muscles.

So far the figure has only been completed below the waist: The rest of the body won't be available for a year or so. The company says that an EVE version is also in the works, but since A.D.A.M. doesn't have any ribs yet, that may take a while. ■

ISAAC ASIMOV WOULD HAVE BEEN PROUD

.....
Flakey, Flash, Dewey and Archi have accepted the challenge, but so far there's no word from *Forbidden Planet*'s Robby or his bubble-headed cousin from *Lost in Space*. Flakey and company are among the mobile robots participating in the first AI Robotics Competition and Exhibition, to be held in San Jose next month under the sponsorship of the American Association for Artificial Intelligence., of Menlo Park, Calif.

The competition's organizers hope the contestants will serve notice to the research community of the potential of mobile machines. Currently, most robotic installations consist of stationary robots or robotic arms, but applications for mobile units are on the rise, according to the association. The competing machines, bearing the flags of university labs, think tanks and private and public research groups, will try to negotiate obstacle courses and identify and retrieve objects. The eyes and ears of the mechanical marvels will include sonar sensors and television cameras.

With contestants like Bert and Ernie, a pair of midget-sized interactive robots, you'd hardly expect a stuffy scientific atmosphere to prevail at this meet. In fact, the sponsors expect a good deal of chaos as well as excitement. Among those cheering on their cybernetic progeny will be NASA, Brown University, MIT, MITRE Corp. and Nomadic Technologies. ■

TRENDLINES

MAPPING THE FAMILY TREE

Can't remember the name of Aunt Ethel's latest husband? What about the new baby of your second-cousin-twice-removed? If you're having trouble keeping track of the tangled branches of your family tree, there's a software program that can help.

Family Origins, from Parsons Technology of Hiawatha, Iowa, is designed to meet the needs of both casual and serious family historians. Capable of tracking more than 7 million individuals within 255 separate databases, the program helps trace the relationships among all family members.

Each individual record includes fields for name, birth,

christening, marriage, death and burial information. Biographical notes can be tagged to data fields describing such details as birthplace and marriage ceremonies. There are even fields for tracking multiple marriages and the children produced by each. Entries are displayed in the traditional tree-style format to graphically

show relationships among individuals.

The program produces 17 charts, including ones for ancestors, descendants, pedigrees, family groups, summaries and reports on notes and sources. Family Origins requires an IBM-PC or compatible, 512K RAM and DOS 2.11 or higher. Suggested retail price is \$49. ■



CRISIS MANAGEMENT

COMPUTER-AIDED SPIN CONTROL

It couldn't save Dow Corning from having to fire its CEO and withdraw from the silicon breast-implant market. Nor could it ensure that the implants were adequately tested in the first place. But technology did help the beleaguered company defend itself in public.

At a Fordham University conference entitled "Managing Crisis: The Role of Real Time Response," Barie Carmichael, Dow Corning's U.S. vice president of corporate communications, described how her company exploited its IT infrastructure to minimize the damage done to its reputation by a federal inquiry into implant safety.

During the crisis, management turned the corporate E-mail system into a news wire, broadcasting news updates and the company's offi-

cial views to employees. Carmichael's office also employed the system to send press releases to corporate public-relations staff in other countries. And the new CEO used videoconferencing to introduce himself to Dow Corning employees around the world.

But IT's most important role was in helping Dow Corning decide what to say. Before the crisis broke, Carmichael's staff had set up a PC database to track press coverage of the implants. The database, which tracked topics such as regulatory issues and whether coverage was favorable, unfavorable or neutral, helped the department hone its responses. For example, Carmichael's staff found that numerous reports addressed the question of a relationship between breast

cancer and the implants, alerting them to the need to deal with this issue in their PR efforts.

U.S. corporate-communications and regulatory-affairs officials held videoconferences with their counterparts worldwide. These meetings helped the Americans to understand the regulatory environment in foreign countries where Dow Corning does business. Once her department had worked out a strategy for each market, Carmichael again used videoconferencing to train PR staff how to respond to the controversy in their own countries.

Dow Corning also set up an 800 number so customers could call in with their concerns. The information gleaned from these phone calls further guided the PR efforts.

The bottom line, according to Carmichael: Technology saved the company time and plane fare, kept Dow Corning's publicists around the world ahead of the story as it evolved, and helped hold down the number of negative press reports. ■

A SOFTWARE-BUYERS GUIDE

It should come as no surprise that vendors trying to sell you software are armed with a thorough profile of your demographics and habits as a buyer. What is surprising is that some of them are using software to help peg you as the super user, pragmatist or opinion driver that you are, and modifying their attacks accordingly.

DRK Inc., an advertising and marketing agency in Boston, employs a homegrown software modeling tool to help its software-vendor clients "type" their prospects and customize sales pitches to suit the buyer profile. For example, the program will likely classify a CIO or LAN manager as an "Outer-Directed Mass Driver"—someone who evaluates and buys products for hundreds or thousands of users. The program also suggests how to pitch to such a buyer, pointing out that mass drivers desire reams of product information to help justify highly visible purchase decisions. They are therefore susceptible to pitches that emphasize the risk of making the wrong decision (on a competing product, naturally).

Other purchaser models include "Techno-Driven Super-Users," who see the product as hero, and the "Advanced Pragmatists," who aren't concerned with technology but will often buy the first thing they see that solves a problem. "Opinion Drivers" have no direct buying power but can influence purchases, while "Seekers" are highly impressionable and tend to like positive brand images. ■

The IEFTM works. For Aetna. For Rhône-Poulenc Rorer.

The success of Texas Instruments I-CASE product is proven—in the field.

There is an integrated CASE product that works. It works now...and it works well.

The IEFTM, or Information Engineering FacilityTM, is in use now by successful companies, large and small, all over the world.

Major gains in productivity, quality, and maintainability.

Productivity gains in initial development are hard to measure, but reports of 2-to-1 improvements are fairly common—and some go as high as 5-to-1.

Quality improvements are dramatic. Users are getting more of what they need to run their businesses. Systems get up and running easier and faster.

As for maintenance, a Gartner Group study showed that, even back in 1990, more than 80% of IEF developers were getting gains of from 2-to-1 to 10-to-1.

Now, develop on PC and generate for DEC/VMS, UNIX. TANDEM, WINDOWS available soon.

The IEF has generated applications for IBM mainframe

environments (MVS/DB2 under TSO, IMS/DC and CICS) since early 1988. Now you can develop systems in OS/2 and automatically generate for DEC/VMS and some UNIX platforms. TANDEM, Microsoft[®] WINDOWS, and more UNIX will be available soon.

Developers give IEF highest rating in COMPUTERWORLD.

COMPUTERWORLD magazine's

"buyer's scorecard" showed that developers ranked the IEF first among all I-CASE products in the study, particularly in the areas of application quality, programmer productivity, and value for the dollar.

New tutorial provides very fast, friendly IEF training.

We believe our new Rapid Development Tutorial is a breakthrough in CASE training. We gave it the broadest possible beta test—more than 100 companies participated. Developers were able to learn to build systems with the IEF more quickly than ever before—some in as few as five days!

Special "Starter Kit" offer combines new tutorial and full-capability PC toolsets.

The new IEF Starter Kit will give you everything you need to start building systems with I-CASE on your OS/2 PC.

Along with the tutorial, the kit includes our standard OS/2 PC analysis, design and construction toolsets as well as testing and code generation in C. (A COBOL compiler is optional and priced separately.)

There's also 90 days of "hot-line" support.

The kit is priced at \$10,000 (limit one per customer company). That's about one-half the regular cost of the toolsets.

If you're not convinced that the IEF can work for you, here's a chance to see for yourself—at a special low price and (with the new tutorial) in a very short time.

To order an IEF Starter Kit, or for more information, call 800-527-3500.

Government purchasers, please reference GSA #GS00K92AGS5530

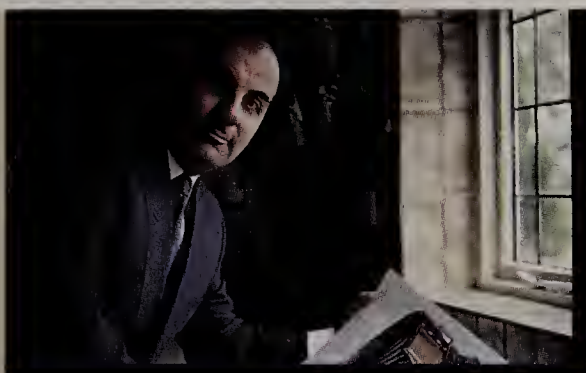
 **TEXAS
INSTRUMENTS**

Target. Rolls-Royce. Canadian Airlines. Sony.



"Our first major project was a mission-critical system for our Managed Care operation. Conventional development would have taken 2-3 years...with the IEF, we built the first release in only 13 months. The IEF is now our company CASE standard."

Richard F. Connell
VP, Information Technology
AETNA



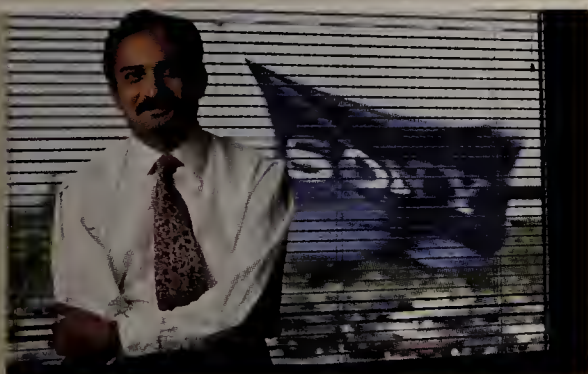
"MERLIN is mission-critical—the most far-reaching business systems initiative we've ever undertaken. Over 400 transactions are in production, with 800 more to be added in the next three months. We could not handle this scale and complexity without IE/IEF."

Wal Budzynski
Head of Operations, Systems/Computing
Rolls-Royce Aerospace



"With previous methods, we would have had to compromise on an 'okay' 10-screen Lease Accounting system. With the IEF, our users got everything they wanted—an outstanding 40-screen system—in the same time. They are requesting the IEF for all future systems."

Tom Jeffery
Sr. VP, Information Systems
Target



"The IEF offers dramatic improvements in productivity, yet it's easy to learn. One example: We trained 23 developers, including 18 new hires, and then completed a large order processing system—300 transactions—all in only 20 months."

Venkat (Vinnie) Tiruvilumala
Director, CPC/CPPC Information Systems
SONY Corporation



"We used an IEF frequent flyer template to build our 'Canadian Plus' system. A major redesign, estimated at 4-6 months using previous methods, took less than a month. Now we're providing better customer service, and maintenance costs are greatly reduced."

Bill Palm
President, Canadian Technology Services
Canadian Airlines



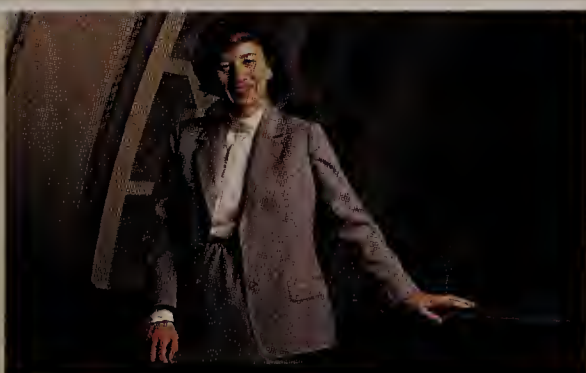
"Our new Customer Order Services Marketing Information System—over 500 transactions and 250 entities—is in production. Quality is excellent and our users are very pleased. Dedicated people armed with the IEF advantage have made COSMIS a success."

James R. Engle
Director, Systems and Programming
Rhône-Poulenc Rorer



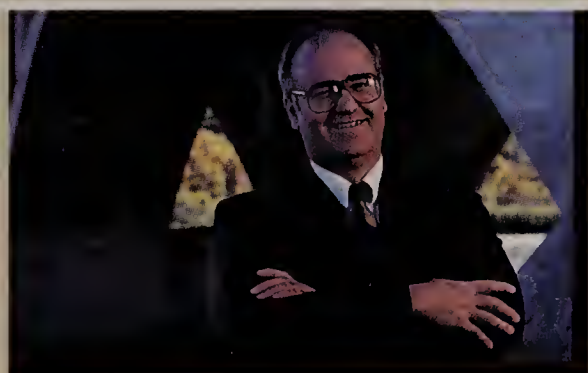
"Your new IEF tutorial was a way to quickly become familiar with the IEF and see how the IEF will allow quality systems to be built very quickly. I feel I now know how to build systems using the techniques described."

Roger Strand
Application Development Consultant
First Federal Lincoln



"The IEF tutorial is very well done. I feel comfortable with this software and I have acquired the skills to build simple systems. The tutorial is a very fast and effective means of evaluating the capabilities of the IEF."

Margaret Kubaitis
Research Programmer, IS&S
University of Illinois



"The IEF tutorial is put together very well and quickly illustrates how to construct a system using the IEF. It gives one the basics to start getting the job done. I feel I am prepared now to build simple systems using the IEF."

K. E. Peacock
Data Administrator
City of Saskatoon, Saskatchewan

TRENDLINES

TAKING THE CIO PULSE

NEEDED: A CRASH COURSE IN MARKETING

A recent survey of CIOs suggests that a welter of factors makes life at the IS helm both confusing and turbulent. While this is not in itself a new or startling conclusion, the survey, conducted by New York-based consulting firm Gateway Information Services, puts in perspective some of the conflicting pressures, loyalties and judgments to which many CIOs are subject.

Begin with the fact that 82 percent of respondents recognize that their clients in, say, the marketing group have needs and priorities that differ significantly from those of finance/administration. For example, users in marketing want IS to provide flexibility above all else, whereas users in finance/administration want accuracy (and rated flexibility as their lowest priority). In both instances, users will base their satisfaction with IS

on whether these priorities are met. And yet nearly 54 percent of the CIOs polled said they market their services identically across the various constituencies. Moreover, since nearly 30 percent of respondents report to the CFO, the authors conclude that IS may exercise some bias in perceiving user needs toward the priorities of those in finance/administration and against those in marketing or operations.

While CIOs purport to have a clear sense of senior management's IT priorities, those perceived priorities are in conflict with what CIOs believe are the leading causes of management complaints about IS performance.

For example, although 65.8 percent of respondents cited concern over the cost of IS services as the chief complaint of upper management, only 24 percent ranked it as

the number-one management priority, and only 47.1 percent placed it among the top three. The second- and third-most-numerous management complaints about IS performance concern its flexibility (42.8 percent) and its delivery of applications (38.7 percent), but respondents ranked applications as the fourth-place priority and put flexibility seventh (and last).

When it comes to evaluating their CIOs' performance,

management considers three primary sources—none of which is the IS group itself: Most often they apply the "soft" criterion of the "perceived business impact" of the IS agenda (29.1 percent); next they seek out the opinions of the user community (26.7 percent) and other management (26.1 percent). Only 7.8 percent of management information on IS performance is gleaned from IS-generated reports. ■

WHAT YOU SEE IS WHAT YOU GET

You're putting together a multimedia presentation on the effects of pollution on historic ruins. You've got a picture of some Ephesian columns, but it's not particularly striking. You know you've seen another of the same columns that exactly captures a point you want to make, but you can't remember where.

Wouldn't it be great if, from your

numbers," said Alex Pentland, professor and co-director of MIT's Vision and Modeling group. "The next step is to teach computers to understand what they see based on visual content rather than textual information." Using advanced image-analysis tools that will enable computers to search for and track both still and motion imagery, and multimedia management systems

employing knowledge-representation and -presentation technology, the computer would retrieve all pictures, images and video files containing the desired image.

The main barrier to the development of multimedia applications is the cost and difficulty of searching and editing image data.

"Billions of dollars and millions of hours are spent every year...searching for and manipulating images," Pentland said.

"Through our research and the practical applications of the resulting technology, you will see this money and time reduced by an order of magnitude." ■



own PC, you could search an image database for the picture based on its actual visual content rather than a textual description? The MIT Media Lab has won a five-year contract from telecom giant BT to develop technology that will do just that.

"Everything we do with computers...has been based on letters and

RESCUE 101

Syracuse University is giving new meaning to the phrase "emergency response" with a system that takes advantage of integrated voice-data technology. The university's 711 Emergency Response Service uses a trial version of IBM's CallPath/400, which links its AS/400 computers to a central office switching system in the local NYNEX telephone company.

When a call comes in from any point on the Syracuse campus, the security officer taking that call simultaneously receives a computer screen with such crucial information as the building and room number from which the call was placed, the location of the nearest fire exits, and whether the call was made from a stalled elevator. The system also supplies pertinent medical information, supplied by students and personnel, that can mean the difference between life and death in certain emergencies.

The immediate benefit of the system to the university's more than 16,000 students, faculty and staff is that it reduces worry. In the long run, the university hopes it will save lives. ■

Without AT&T, a problem down here could sink your business.



© 1992 AT&T

At AT&T, providing state of the art overseas private line service is just part of what we do. Providing state of the art backup is the rest of the job.

Our special routing options provide the ultimate in security for your private network.

For example, AT&T International ACCUNET® Digital Services offers you the option of diversity. So your backup can be on a separate

cable, not just a separate line.

And AT&T SKYNET® International Service, our satellite network, also provides the option of physically separate routes to ensure performance.

But special routing options are just one reason to choose AT&T. Our 60 years of international experience is another. We have solid, established relationships with phone companies around the world. And AT&T representatives in 32 countries.

So before you make your next international call, call AT&T at **1 800 448-8600, ext. 333.**

You'll see why AT&T is the best company to keep your information systems afloat.



AT&T

The right choice.

Only NCR Offers Open Sy To Consolidate Your Sc



Systems Powerful Enough to Gather Scattered Information.

Putting Isolated Data Together Gives You Better Access To A Bigger Pool Of Information.

In most enterprises, data tends to collect in small, isolated pools, usually in a workgroup organized around a small server. Unfortunately for the enterprise, much of this mission-critical information is not easily accessed by others in the organization who have need for it.

NCR System 3400 and 3500 servers offer the most powerful and cost-effective means of consolidating that scattered information. In combination with our COOPERATION® integrating software and networking products, our servers can consolidate the functions of many smaller systems, saving money on hardware and greatly simplifying network administration. While giving your workgroups and knowledge workers unprecedented access to crucial information.



Our servers are ideal for on-line transaction processing. In fact, the

Best UNIX Server Price Performance (TPC-A Benchmark)*		
NCR System 3450	\$8422/tpsA-Local	100.31 tpsA-Local
Nearest Competitor	\$8854/tpsA-Local	95.41 tpsA-Local

System 3450 has just been rated the best UNIX® server in the world in price/performance on TPC-A benchmarks. The System 3500's fault-resilient capabilities are

enhanced by our hot-pluggable disk technology. And 3500s offer up to 28 fast internal drives and multiple controllers for redundancy and reliability competitive servers can't match.

Our servers are part of a scalable family based on cost-effective micro-processor technology that extends from mobile PCs to future enterprise systems offering over 100,000 MIPS. And since they connect to your current computing environment, you can preserve your investment in proprietary systems while you move toward a more flexible, open future.



For more information on NCR's servers, phone 1-800-CALL NCR. We'll help you put together the information that's critical to your success.



Open, Cooperative Computing.
The Strategy For Managing Change.

*Published by the Transaction Processing Performance Council, Benchmark A, April, 1992. The test was performed with UNIX SVR4 MP-RAS and INFORMIX On-Line 5.0 on a four processor system, and was audited by the independent consulting firm of Codd and Date, Inc.

NCR is the name and mark of NCR Corporation. COOPERATION is a registered trademark of NCR Corporation. UNIX is a registered trademark of UNIX System Laboratories, Inc. © 1992 NCR Corporation.

TRENDLINES

REPORTER'S NOTEBOOK

POINT ME TOWARD THE BEGINNER'S SLOPE

The virtual reality exhibit at the Computer Museum in Boston was not created to show off the arcade appeal of this emerging technology. Those of us attending the pre-show demonstration were invited to see firsthand how VR can be applied to areas such as architecture, manufacturing and medicine. To that end we are being asked to enter a virtual workroom and in 10 minutes build a structure complete with walls, roof and windows. The press material says this is easy, and I trust it.

I settle into the green vinyl chair, taking the wand in one hand and gripping the joystick with the other. I expect it to feel like I am stepping into a View-Master slide, but the surroundings are far more immediate, more palpable, more *real*. I am in a room, surrounded by pale walls. If I had feet (and the realization that I do not strikes so forcefully that I shuffle my shoes for reassurance), they would be planted on a dark-green platform resembling the putting surface on a miniature-golf course. There are posters on the walls, and spread before me are a number of variously shaped building blocks and tiny trees.

Moving my head gingerly, I swing my gaze around the room. Several of the posters look like advertisements—for Sense8 (designer of the software used in the demonstration) and Intel (provider of the digital video board). From the corner of my eye, I spy a colorful landscape, dominated by a rushing waterfall. The image is soothing in this strange, stark environment, and I try to focus on it, swiveling my head and drag-

ging my joystick to the right. But instead I sweep below the picture, swinging wide and landing on the other side of the room, smack dab in front of the Intel ad. I try again, turning my head in a slow arc with the joystick steady. But the waterfall seems to have vanished, and I end up back at Intel.

I decide to make one last effort. I pull back on the joystick, watching the walls slide away under me, and then I am floating above the room. The sensation is pleasant but disorienting, and I surreptitiously shuffle my feet again. I can see the waterfall now, and I attempt a graceful swoop in that direction.

But something is wrong. The room rushes past me and I am floating into a pale brown nothingness. Somewhat panicked, I move my

head and the joystick with sharp, random movements, but all I see is space. I am in a virtual void.

A patient voice near my ear tells me that I have managed to get myself behind a wall, no mean feat apparently. An authoritative hand grips the joystick below my fingers and gently maneuvers me back to a position on the platform, facing the Intel poster. (It occurs to me that virtual reality has enormous potential on Madison Avenue.) I abandon the waterfall idea. Time is short, and I have a house to build.

My first few attempts to select blocks with the wand

are fruitless: I shoot sharp blue lines into corners and at bare spots on the wall. Aiming at a shape that I would like to use as a basis for my structure, I accidentally select a small pine tree instead. I try to shake it loose, but it follows me around for a few moments like a small green terrier.

The fifth time I point to an object, a thin blue outline appears around it. Elated, I drag the block from its place and stack it on top of the one right next to it. (There are better places it could go, but I spy several more trees lurking nearby and I'm not taking any chances.) I quickly select another object and drag it on top of the first two. Then, remembering that I can change perspective, I select the "Get Small" sign. My three stacked blocks loom before me like the poorly executed tower of a somewhat dim giant-child. The druids surveying Stonehenge could not have been more proud.

Just as I am getting the hang of it, my time is up. Another person takes my place and swiftly begins construction of an edifice worthy of I.M. Pei. The joystick rolls smoothly around her palm, and she handles the wand like it is an extension of herself—a sixth finger.

I get lost on the way to the Mass. Turnpike. ■



VISITORS to a virtual world can manipulate objects, proportions, and gravity.

TRY BEFORE YOU BUY

IS professionals can now participate in the network equivalent of kicking tires. NETLAN Inc., a networking value-added reseller based in New York, recently opened a facility where people can test and evaluate network software and hardware systems before making an investment.

The NETLAN Technology Center (NTC) is equipped with a LAN laboratory, briefing room, reference library and classroom. The 6,500-square-foot facility features an enterprisewide network configured with NetFRAME, Compaq, IBM RISC and SUN SPARC servers running multiple operating systems. According to NETLAN President Michael Gansl, the NTC was designed to meet the needs of senior LAN and IS personnel who must contend with the increasing expense and complexity of networking issues.

The NTC also offers a variety of seminars on technical and strategic issues. For additional information, contact NTC Director Richard Close at 212 768-2273. ■

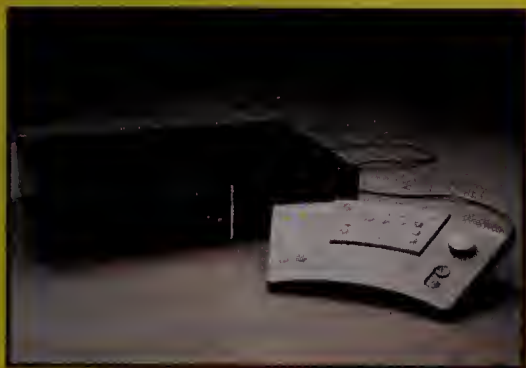
Picture Your Business



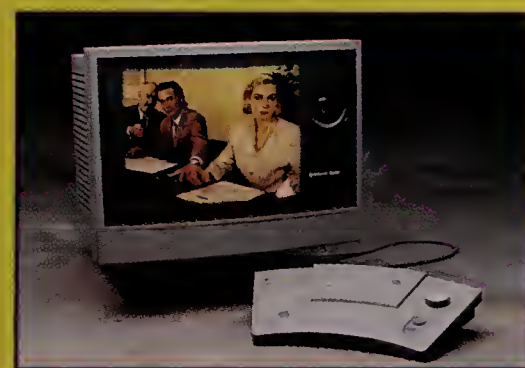
With Videoconferencing by HITACHI

Introducing two new, truly affordable systems that bring the power of videoconferencing to businesses everywhere. The CA-200 and the DP-200 are both easy to use and connect into any digital phone line.* They fit neatly on a table—there's no need for special facilities or equipment. But most important, they offer simultaneous transmission of audio, color video, facsimile and data . . . all in one compact unit.

Get the whole picture by calling 1-(800) 446-8820 and see what your business communications have been missing.



The CA-200 connects to any existing video monitor for the greatest amount of cost savings and flexibility.



The DP-200 is completely self-contained, with a built-in color monitor and up to four audio inputs.

HITACHI

Hitachi America Telecommunications Division
2990 Gateway Drive, Norcross, Georgia 30071

* Requires ISDN or
switched 56K Network.

Getting the Message

As business alliances become more complex and interconnected, CIOs must concern themselves not only with the transmission media handling the increased flow of data but with the quality of the information being sent as well

BY DANIEL S. APPLETON

To the vast majority of businesses, the U.S. economy is akin to an ocean whose movement is described by enormous currents. These currents are massive cash flows, which will send billions of dollars to thousands of firms over the next decade. For instance, the General Motors cash flow supports a 20,000-member automotive supply chain, and the Department of Defense acquisition establishment feeds nearly 50,000 businesses in the defense industrial supply base. Indeed, every major corporation contracts the bulk of its work, often in excess of 80 percent, to a dynamically chosen supply team. These teams compete in the marketplace, and business units of all shapes and sizes compete to be on the teams.

The first strong signals about this emerging partnership market were sent in 1985 by Michael Porter, who

introduced the concept of value chains, and Alvin Toffler, who introduced adaptive corporations. In the 1990s we have begun to hear phrases like agile enterprise, virtual corporation, pick-up team entity, trading partnership, industrial network and plug-compatible enterprise. These phrases basically describe the same tinkertoy-like environment, wherein cash flows are assigned to a purposefully assembled group of autonomous and quasi-autonomous business elements strung together by IT.

The business environment being engineered by today's management teams is hardly hierarchic anymore. It is rapidly converging on Toffler's vision of "framework" and "modules"—of a "constellation" of related companies, organizations and agencies all strung together by what he terms "thin coordinative wiring" (the communications infrastructure that makes these relationships possible). Toffler's model asks management to organize its thinking in terms of business elements that operate simultaneously as wholes unto themselves and as parts of many other wholes. Arthur Koestler, in his book *The Ghost in the Machine*, coined the word "holon" to describe such an entity.

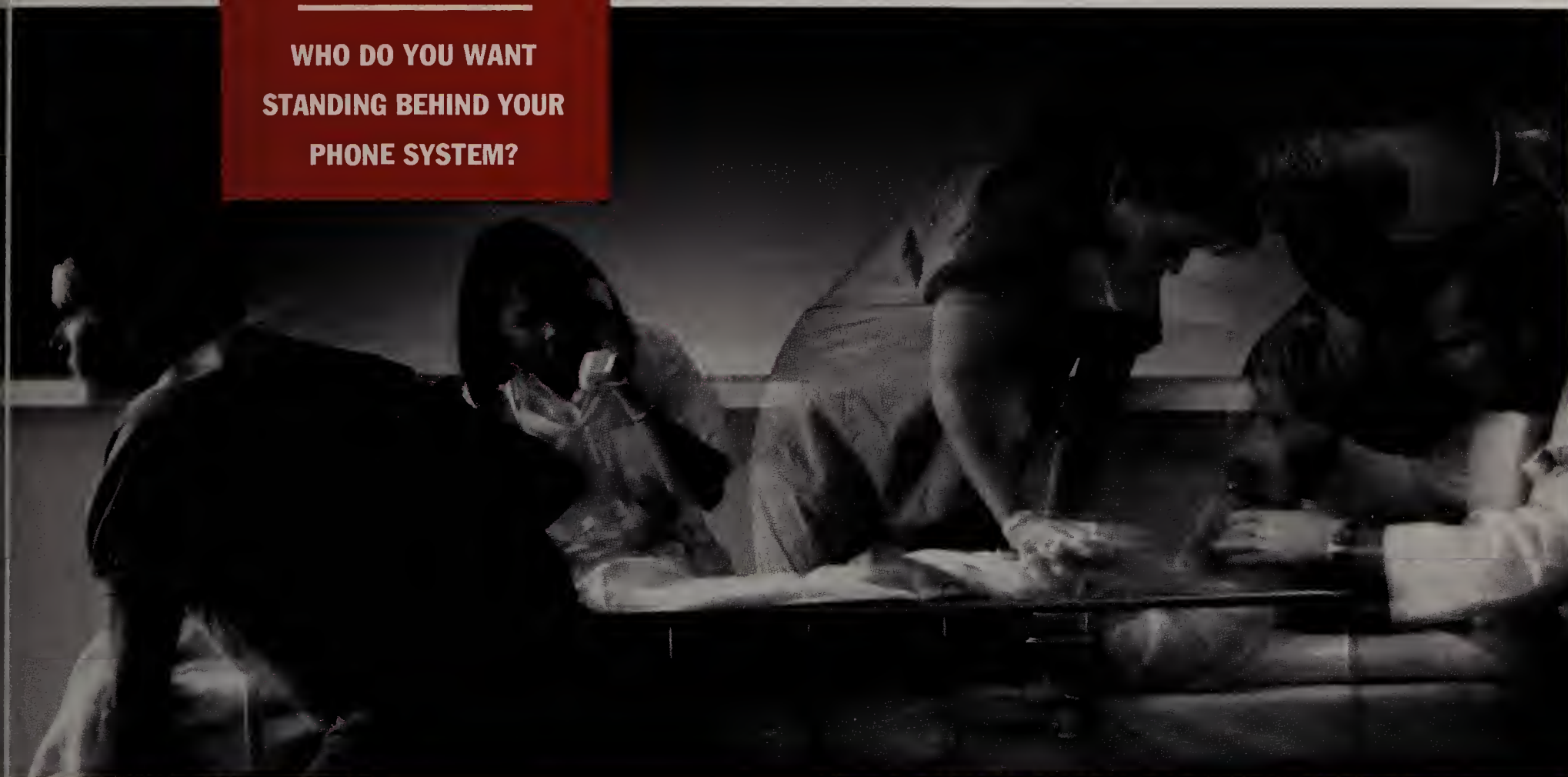
The management paradigm is steadily evolving toward holonics—away from functional departments toward empowered employees, self-managed teams and quality circles; and away from functional organizations toward cost centers, strategic business units, profit centers and centers of excellence. The emerging model consists of permanent and temporary holons that can quickly and efficiently come together into multiple, purposefully focused "holarchies." The more holarchies a holon can effectively support, the better.

In his book *Order out of Chaos*, Ilya Prigogine presents the termite



**WHEN OVER 75,000 LIVES
ARE ON THE LINE**

**WHO DO YOU WANT
STANDING BEHIND YOUR
PHONE SYSTEM?**



When life or death is just a breath – or a phone call – away, you don't pick an ordinary phone system.

You pick one that's based on the simple design premise that *all calls can get through!*

But Fujitsu's non-blocking architecture wasn't the only reason that New England's newest medical center – the \$218-million Dartmouth Hitchcock Medical Center (DHMC) – selected their F9600 digital PBX to take it into the 21st century. DHMC also wanted a system that was compatible with their existing phones. A system that transmitted voice, data, fax and video images to 4,700 terminals over a seven-mile network of fiber optic cable.

And a support team committed to Integrated Services Digital Network (ISDN) applications.

The answer was Fujitsu, a \$21-billion global telecommunications and computer leader serving over 100 countries.

To see what answers the F9600 has for you, call 1-800-553-3263.



The F9600 Digital Telephone from Fujitsu, a \$21-billion global telecommunications leader serving over 100 countries.

FUJITSU

Computers, Communications, Microelectronics

model of management. Each type of termite—worker, nymph, queen or warrior—is a whole unto itself, and at the same time a part of the whole termite colony. At the local level, each is capable of executing its own range of processes. At the global level, these become sub-processes integrated into a holarchic process whose overall effectiveness depends more on the effectiveness of individual sub-processes than on some global process design.

Clearly, the whole could not survive if the parts were not, in the first case, doing their individual tasks extremely well and, in the second, communicating at a very high level of efficiency. In fact, the ability of the individuals in a holarchy to transmit and receive messages is the key to organizational adaptability.

There are only two types of messages that can be exchanged: An information message resolves uncertainty in the receiver; all other messages are noise. The quality of communications in a holarchy de-

The IS function must develop the skills needed to improve the ratio of information messages.

pends on the ratio of information messages to all messages sent. In the termite model, communications quality is extremely high, because all messages are transmitted chemically, in the form of odors. In business, the vast majority of messages exchanged are noise messages. The challenge is to dramatically increase the percentage of information messages exchanged within a holarchy.

The notion of electronic commerce brings to mind a simple image of a complex problem. The mind's eye conjures up an electronic highway whose on and off ramps are open systems interconnects. Traveling down this

highway at light speed are billions upon billions of electronic digits generated by thousands of business holons, destined for trading partners.

Now let's imagine that every bucket of digits traveling over the electronic highway is a one-way transaction between two holons in a holarchy—a sender and a recipient. Expanding from our close-up of the electronic highway, we see a transaction pattern emerge among members of a trading-partner team. As we continue to expand our view, the pattern quickly becomes chaotic, until it looks like a Christmas tree covered with thousands of lights blinking on and off at blinding speed. This is the enterprise. Each blink of each light is a transaction between two holons, and each transaction has a value and a cost.

If a holon is well managed, each blink of its light will be a margin-bearing transaction. Therefore, the natural instinct of each holon is to blink as fast and as often as possible. Further, each holon is motivat-

TAXING Q

Can cities find sources of

EDS helped Chicago answer a definite yes.

Using new applications of information technology, EDS is helping Chicago collect \$420 million in unpaid parking tickets. In less than a year, annual ticket revenues have increased by 50%. Plus, **revenue has nearly doubled** from parking meter collections.

Because drivers now take parking tickets that they receive more seriously, **traffic flow has improved** measurably throughout Chicago. According to Chicago officials, the whole program is a victory for the city and its citizens.

EDS helped the city completely reengineer its parking program. Now,

ed to place itself in as many different holarchies as it can.

But if we think of each holarchy as an enterprise, each blink of each light is a cost that ultimately finds its way into the product. Because it is watching the cost meter, the holarchy management is motivated to ensure that each light blinks only when it is absolutely required to, and that each blink has the minimum possible cost and maximum value. What may appear to be a chaos of blinking lights must actually represent a pragmatic pattern of controlled blinking that can be adjusted at any point in time. Lights can be easily added or removed. Blinking can be sped up or slowed down. It all depends on the needs of the whole.

It is easy to forget that the highway is not nearly as important as the traffic it carries. Although high-speed data exchange is a contributor to holarchic performance, the quality of the transactions that occur among the holons is more important.

Quality must be measured as the ratio of information messages received to all messages sent in the holarchy. Even a holarchy that employs a high-tech data highway will perform poorly if that highway is cluttered with noise messages. It may even be outperformed by a holarchy using a low-tech transaction medium but achieving a high percentage of information messages. The end game is competitive superiority, and that requires high-quality communications.

It is not possible to directly control communications quality. However, it is possible to affect the probability that any message sent within a holarchy will be an information rather than a noise message. This probability is directly affected by the business rules used to control the data that can be used in a message. If there are no business rules, or if the business rules are weak or inconsistent, then any data can be used in a message, and the probability that a recipient will even understand a sender's message is very low. On

the other hand, if the business rules are strong and consistent, and if they are shared by all of the holons in the holarchy, the probability of creating information messages increases dramatically.

We are rapidly evolving toward an environment where management is dramatically improving its skill at building holons and its ability to bring holons together quickly and effectively into holarchies. The IS function must also shape its skills with holonics, else it will defeat management's end game. Traditionally, IS has controlled the transaction medium used to shape holons and to construct holarchies. Now it must address itself to developing the skills needed to improve the ratio of information messages. That is where its real added value lies in the business of the future. 

Daniel S. Appleton is CEO of D. Appleton Co., a business-engineering-services firm based in Manhattan Beach, Calif.

QUESTION:

revenue other than taxes?

hand-held computers are used to record and print out tickets on the spot. The information is automatically uploaded to a central computer, resulting in a **faster collection process.**

A computer mapping system helps locate and solve parking problems, dramatically improving traffic flow.

Conveniently located hearing centers use imaging technology so citizens can resolve violations faster—by phone, mail or in person. **No more long waits** in traffic court. And, the city is providing citizens a valuable service.

New technology is creating many opportunities. To learn more, contact

EDS, the world leader in applying information technology. Write Barry W. Sullivan, Director of Marketing, EDS, 7171 Forest Lane, M3, Dallas, TX 75230. Or call (214) 490-2000, ext. 103.



TAKE ADVANTAGE OF CHANGESM



The man with too many yo-yos.

So you're in charge of information systems, usually, for this sprawling operation with hundreds of locations in faraway places populated almost exclusively by people who, hopefully, are better at their jobs than they are at using PCs to communicate back and forth with the home office, plus a growing gaggle of near-impossible-to-support mobile users, when this "Memo" from the corporate stable of Harvard prodigies with perfect teeth hits your desk with an ominous thud and a casual mandate that you whip this puppy into a "networked electronic enterprise" which, translated, means info on yesterday's operations consolidated and delivered to every manager's PC by 8:00AM their time, no matter where it is (whoa!), using forms-based workflow to and from central site SQL databases, not to mention ad hoc query capabilities for those mobile PCs, electronic ordering from suppliers and the electronic delivery of text and graphics-based order forms and catalogs direct to your customers' PCs, all of which raises the specter of homebrew polling solutions and the agony of long-term support for in-house-developed applications, and you start to feel that bad kind of sweat making an executive form of diaper rash around the inside of your collar right up until you decide to take a closer look at that RemoteWare™ proposal from XcelleNet® which was specifically designed to tame your yo-yo-like network via communicating applications that use low-cost, occasional connections over all kinds of telecommunications facilities, and are created and delivered electronically to remote and mobile PCs by operations managers without adding to the already-nasty programming load of your beleaguered staff and sparing acres of innocent rain forests from unnecessary slaughter, so you call the XcelleNet guy and he's calm so you're calm and you route your polite "I'm way ahead of you" response back to Mr. Ivy League MBA, and that's when you get this amazingly complimentary call from the boys on the Board....and they want to make you president or something.

REMOTEWARE™

*Communicating
Applications*

To find out how RemoteWare information delivery systems solve problems for hundreds of organizations in over a dozen industries, call 1-800-322-3366. **XCELLENET®**

BIG WAN ON CAMPUS

Richard A. Detweiler never credited the argument that technology and traditional learning don't mix. To Detweiler, vice president and professor of psychology at Drew University, IT always seemed like the perfect tool to enhance a liberal arts education. As far as he was concerned, computers should be as central to the college learning experience as the library or classroom.

Several years ago, Detweiler turned his vision into reality at Drew University in Madison, N.J. He spearheaded two projects that gave every student and faculty member his or her own networked computer, running a variety of applications. Now E-mail is as commonplace as English 101, and students are finding that their computer literacy remains handy well after graduation.

Detweiler was an early convert to using IT. When he arrived at Drew in 1973, he was already familiar with mainframes, and he wrote his dissertation on a rudimentary word processor using punch cards. "I think I was relatively computer-literate for the time," he said.

The idea for the Computer Initiative

The pervasive use of computers and communications technology at Drew University has turned it into a showcase for education in the future. It has also boosted enrollment and strengthened Drew's position in a competitive market.

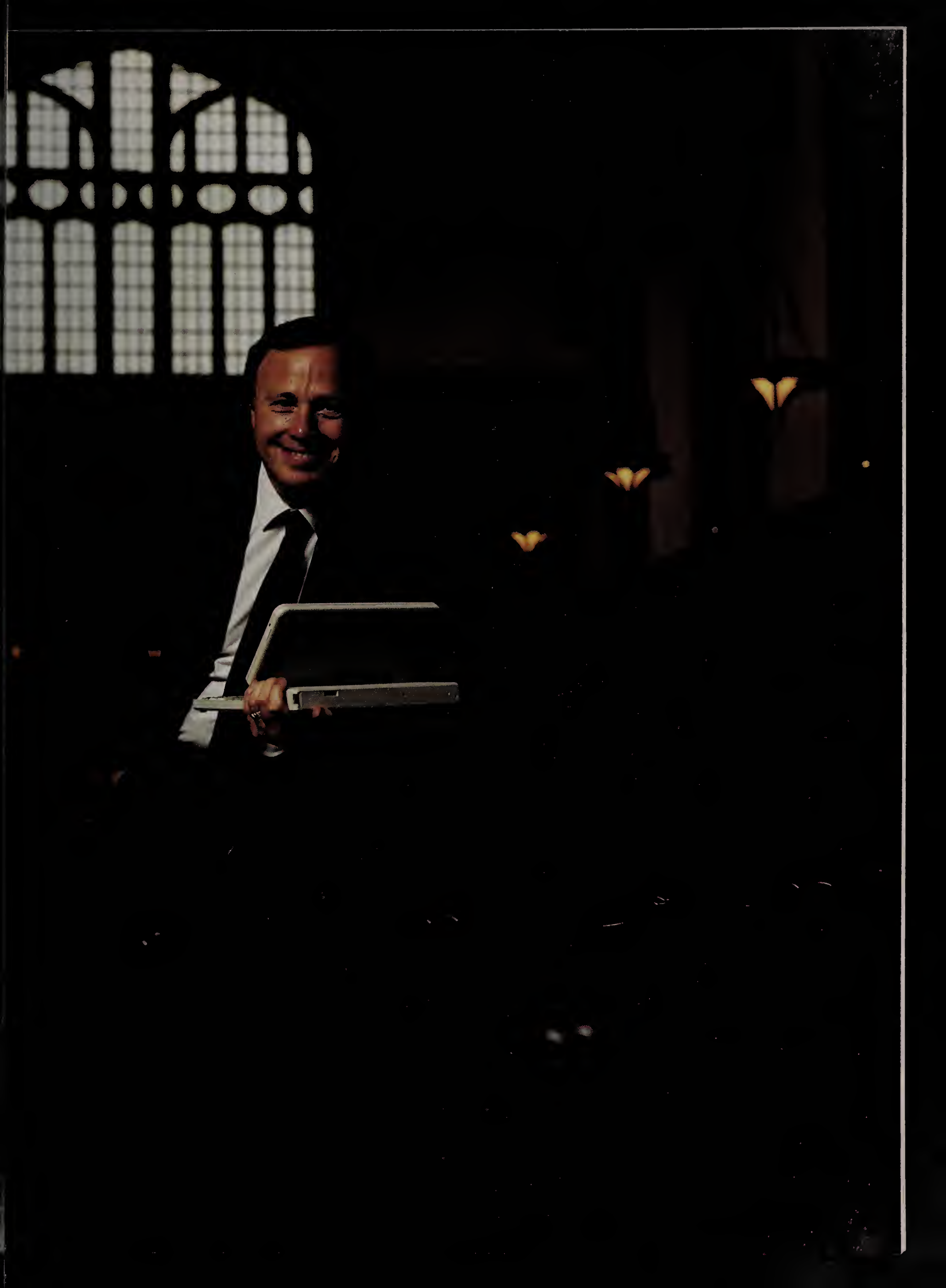
in the academic community. "The information age promised a future filled with academic applications," he recalled. "Computers in education made sense, particularly as a tool for communicating and thinking in the liberal arts."

At the time, introducing IT to a college campus typically involved establishing a central lab with computers hooked up to a mainframe. However, as PC technology evolved, Detweiler became convinced that putting a machine at everyone's disposal was the only way to go. "IT tools would only be meaningful if they became a part of the everyday living and working environment," he said. "And the way to do that was to make technology pervasive." The \$4.5 million Computer Initiative called for providing each of the 400 staff and 2,100 graduate and un-

project grew out of Detweiler's work as a professor of psychology. One of his major areas of interest was looking at ways in which people can bring about social change. In 1980, while he and a colleague were conducting research on how Drew could affect higher education and society in general, he realized that IT could play a significant role with-

RICHARD DETWEILER: "It's hard for me to be quiet about IT in education. I don't think there's any choice."

BY MEGAN SANTOSUS



Training Tomorrow's Workforce

.....

All workers will be affected by the shift to a knowledge-based economy. College preparation can help.

Starting in the next few years, every college graduate in the country will be expected to have a working knowledge of computers and various kinds of software. So believes William Johnston, a senior research fellow at the Hudson Institute, a not-for-profit research organization in Washington, and coauthor of "Workforce 2000", a report sponsored by the U.S. Department of Labor outlining the changing nature of work.

"Workforce 2000" examines the general skills that will be required of workers in the future. While computer literacy is not specifically addressed, Johnston maintains that technological competency is an important component in the overall range of skills that a worker must have. "Computers are a hardware symbol of the shift to a knowledge-based economy," he said. "As a result, every person will need to have more-detailed skills and knowledge than before."

All workers will be affected by the infusion of technology into the workplace whether or not they use computers. In Johnston's opinion, universities that make computers available to every student are helping prepare people for the changing business environment.

Johnston acknowledges that there is still a great deal of resistance within the education community. For one thing, universal computing requires a big investment that is hard to justify in these times of stringent budgets and falling enrollments. Moreover, many educators are reluctant to use IT tools because they are not sure knowledge can be as effectively conveyed through an electronic medium. And many colleges and universities resist being viewed as training grounds for the workforce.

As Johnston sees it, projects like those at Drew can only help to prepare the workers of tomorrow. "We're just beginning to explore the possibilities of networks and sophisticated technologies," he said. "So it's a good idea that students' minds are opened to the power of IT tools."

-M. Santosus

dergraduate students with a PC, printer and basic software. Individual ownership was an essential component of the project; the cost of the equipment would be included in tuition, and students would get to keep their systems after graduation. (Faculty and administration systems were paid for by the university.) By the fall of 1983, advances in microprocessor technology made implementation feasible.

The biggest hurdle Detweiler faced

was selling the concept to the administration and faculty. As it turned out, Drew's president and CFO were enthusiastic backers from the start, and only one faculty member dissented during the approval process. After just one month of hearings, the Computer Initiative was given the green light. According to Detweiler, the faculty deserves much of the credit for the success of the project for demonstrating "an incredible leap of faith."

When the program was announced, the number of applicants to Drew increased by 42 percent; enrollment has since remained steady despite a shrinking pool of applicants nationwide. "Getting computers was a bottom-line decision," Detweiler said. "As one of 1,500 liberal arts colleges in the country, we needed the project if we wanted to become a leader and help define education in the future."

The first PCs, Epson QX 10s, arrived on campus in February 1984 and were used by the faculty and administration. When the freshman class showed up at the beginning of the fall semester, they found systems waiting for them. Upperclassmen had the option of buying their own equipment at discounted prices or using newly established computer labs. As subsequent classes enrolled, the labs were gradually phased out.

With the Computer Initiative firmly in place, Detweiler continued to investigate new technologies and applications. By 1987 he had another project in the works that would support the ability to share information. The aim of his second effort was to add a network with voice, data and video capabilities. "I think our approach to networking was unique," Detweiler said. "We wanted to link people together and offer them a range of networking services, because human communication in the future will occur through a variety of methods."

One year and \$3.2 million later, the Knowledge Initiative was up and running. Students, faculty and administrators now communicate, regardless of time and place, through extensive E-mail and voice-mail applications. Every PC is linked to the library, and users have access to a variety of off-campus networks, databases and library services.

Once the links were established, Detweiler negotiated a partnership between Drew and Bell Atlantic to provide broadband networking services to each dorm room, classroom and office on campus. Broadband capability gives students direct access to internal educational and interna-



Do you notice anything unusual about this man's computer?

No, it's not an aberration of Newtonian physics.

This man's computer stays attached because he's wearing it. That's right, wearing it.

With the introduction of PalmPAD™, GRiD has created far more than just a new pen computer. We've set the new standard for data collection applications.

Frankly, nothing is easier to use. Entering data, drawing graphics and capturing signatures is a snap.

And PalmPAD is light. Only 2.8 pounds.

Yet, it's tough enough to withstand a 3 foot drop without suffering brain damage.

GRiD PalmPAD also features a large backlit screen. Plus, it's MS-DOS® compatible. So you can customize software applications in no time at all.

And because PalmPAD was designed to accommodate either a modem or a spread spectrum radio, your work force will become a mobile communications center.

Does this mean the end is near for paper forms

and conventional handhelds? We think so.

Because whether your mobile work force collects data on their feet, or hands for that matter, nothing improves the speed and accuracy of collecting information like PalmPAD. For more information, call 800-222-GRiD. And hear about the computer that's turning an industry on its head.

GRiD
Wherever work gets done.™

GRiD Systems Corporation, 47211 Lakeview Boulevard, P.O. Box 5003, Fremont, CA 94537-5003. For information in Canada, call 800-387-0174. In Europe, fax us in the U.K. at (44) 081-759-0466. For South America, Asia, Pacific Rim and the Middle East, fax us in the U.S. at (415) 683-0903. ©1992, GRiD Systems Corporation. PalmPAD is a trademark of GRiD Systems Corporation. All other brands are trademarks of their respective holders.

Applied Knowledge

Drew graduates are taking their IT and communications skills into the workplace

Theresa Borgia, an account associate for The Bases Group in Parsippany, N.J., uses a computer extensively to do statistical analysis and word processing. She says her experience at Drew not only prepared her for the job market, but continues to be helpful in her job. "The fact that I had my own PC and had been using it for four years definitely helped [make me] more attractive to employers," Borgia said.

Furthermore, Borgia believes she is less intimidated than many peo-

ple by the prospect of learning new applications. "A lot of programs and packages I use are new," she said, "but once you're familiar with one, it's pretty easy to pick up new ones."

When Elizabeth Bloetjes began her job as a communications assistant at the Prudential Private Placement Group in Newark, N.J., she already knew how to use the word-processing and voice-mail applications because they were identical to those she had used at Drew. While other employees took introductory courses, she was able to get advanced training.

Bloetjes found Drew's approach to IT ideally suited to her needs. "If I wasn't introduced to computers as part of my education," she said, "I wouldn't have been motivated to learn on my own."

Computers were being implemented at the Paper Mill Playhouse in Millburn, N.J., just as Heather Bennett began her job as assistant to the general manager. She used her knowledge of computers to help train her fellow employees.

"I told my employers before I

started that I knew WordPerfect," she said. "I was able to use what I learned in school to teach classes to the staff."

Now that she is a casting director, Bennett puts her practical experience to work every day.

"I had to force myself to use a computer when I first got to Drew," she said. "I don't think I could survive without one now."

Even former students whose jobs don't require knowledge of computers have benefitted from the skills they learned at Drew. As a criminal-case supervisor in the Essex County New Courthouse in Newark, James Jones rarely uses a computer. His job consists mainly of interviewing defendants and writing reports. Yet he believes that Drew's network contributed to his communication abilities.

"I probably spent too much time on the network, talking to other schools and different countries," admitted Jones. "But it certainly was a mind-opening experience that I'm grateful for."

—M. Santosus

tional video broadcasts. For example, students can watch a Spanish news show or a personal screening of an anthropology film without leaving their dorm rooms.

Laptops were introduced in 1988. Now each individual system includes a Zenith '286 laptop with a 40MB hard drive, an Epson dot-matrix printer and a complete telecommunications package including modem. Software includes WordPerfect 5.1 and basic systems programs. Users can log into a central Digital Equipment Corp. VAX 6330 server where some networking functionality resides. Students are extremely enthusiastic about the system's portability, according to Detweiler. Weather permitting, he said, it's not unusual to see them working on their computers outdoors.

New students are offered weekly workshops in such basics as turning on the PC and sending and receiving E-mail. Extensive technical knowledge is not emphasized; Drew

is primarily concerned that people be at ease using IT tools.

Both initiatives have been integrated to the point where the entire community is expected to use IT as a part of the educational experience. Drew's program has served as a model for liberal arts education nationwide; several schools—including Lynchburg College in Virginia and Lafayette College in Pennsylvania—have adopted similar programs.

Detweiler himself was recognized with a 1991 Award for Achievement in Managing Information Technology (sponsored by American Management Systems and Carnegie Mellon), which cited his commitment and vision in blending technology with learning. But in his opinion, the ultimate success of his efforts is best evidenced by the students who leave Drew with an understanding and appreciation of technology (see related story).

Next fall, Detweiler will take over

as president of Hartwick College in Oneonta, N.Y. Although Hartwick has not implemented IT on a scale comparable to Drew's, Detweiler is not going with an agenda to replicate his accomplishments. "I was attracted to Hartwick because of the commitment to educating students for the 21st century in an international world," Detweiler explained. "Teaching people to understand and use technology will obviously be a part of that commitment, but IT implementation has to meet the specific needs of people where they are."

Detweiler is aware that some academics remain skeptical of IT, and he often has to resist the temptation to get on his soapbox to preach about the possibilities. "It's hard for me to be calm and quiet about IT in education, because I don't think there's any choice," he said. "Not because technology is our master, but because it allows people to be more effective in the information age." □



The basic one-year subscription rate for CIO magazine is \$94.

Subscribe And Save.

~~\$94~~ \$59

Yes, enter my one-year subscription to *CIO* magazine and bill me later for only \$59, a savings of over 37% off the basic rate.

Name

Title

Company

Address

City State Zip

**This is a domestic rate only (Canada & US). The foreign rate is \$175 US.*

692

**PROCESS
IMMEDIATELY**



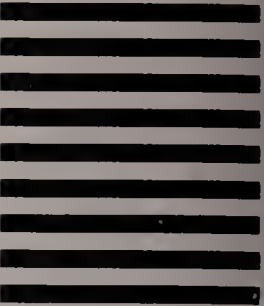
NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 1020 FRAMINGHAM, MA

POSTAGE WILL BE PAID BY ADDRESSEE

CIO Magazine
Attn: Circulation Department
P.O. Box 9208
Framingham, MA 01701-9900



CTO

THE MAGAZINE FOR INFORMATION EXECUTIVES

CTO PERSPECTIVES SERIES

The Process of IT: Organizing for Success

Head to Head

The Machiavellian CIO

Seizing the
Customer Moment

Outsourcing and the
Corporate Mission

Winning through
Reengineering

Prime Time
Client/Server Computing

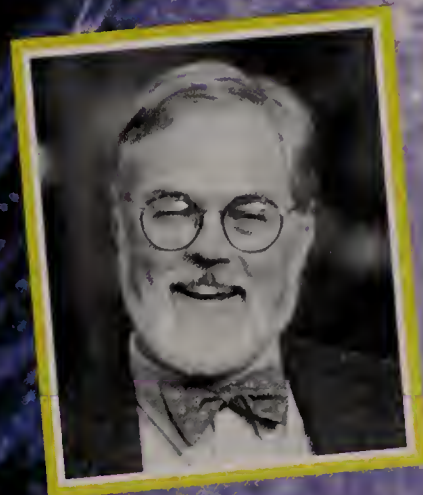
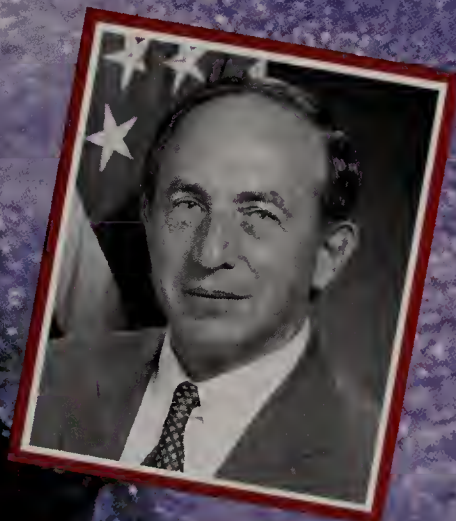
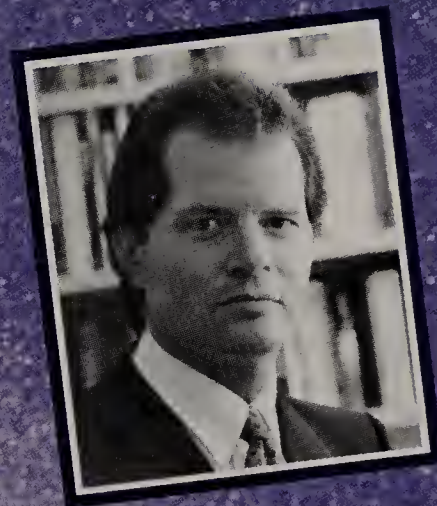
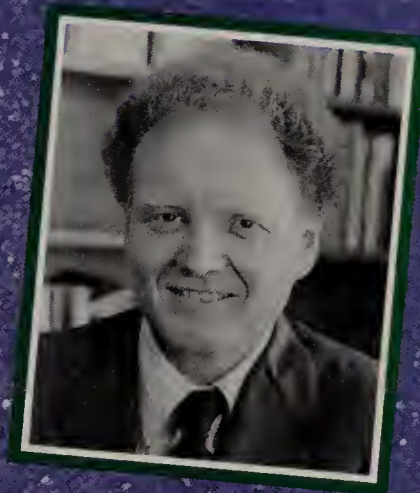
Waves of Change

Defense and IT

Never Mind What You Know...

CONFERENCE SUPPLEMENT
to CIO MAGAZINE

BOCA RATON RESORT & CLUB
BOCA RATON, FLORIDA
OCTOBER 11-14, 1992



CIO

CONFERENCE SUPPLEMENT

Conference Overview

Joe Levy and
Lynda Rosenthal

Waves of Change

Agenda

Session topics, presenters and
scheduled activities are outlined.

Companion Program

Bring your companion!
He or she will join you in conference
receptions and meals while
participating in a separate program.

Boca Raton Resort & Club

A five-star property in a grand location.

Conference Hosts

Select industry product and service
providers will be on hand.

Enrollment Form

Don't wait!

Conference Overview

Ask a dozen people what "process" means and you'll get a baker's dozen answers. Process transcends management and technology; yet it is the essence of both. As we continue to examine each and every element in the overhaul of our business systems and practices, we must simultaneously uncover the keys to enrichment and satisfaction for ourselves and our coworkers.

The next CIO Perspectives conference, The Process of IT: Organizing for Success, will bring together authorities and practitioners from multiple disciplines. Moderated by Jim Wetherbe, director of MIS research and professor of MIS at the University of Minnesota's Carlson School of Management, the conference will target the three issues that successful information technology management must address: infrastructure, enabling technologies and management and control.

Lester Thurow will establish the context; Doug Nagan will talk politics; Tom Harbison, Chris Bluemer and Kathleen Taylor will tell war stories. Paul Strassmann will describe the challenge of reducing the Defense budget while satisfying increasing information demands; panelists will discuss IT as the business process change enabler and pioneering new operating models. And Robert Fulghum will—well—delight us.

As in the past, there will be a variety of formal and informal gatherings where participants can discuss these and other issues, all in the setting of Florida's five-star, 223-acre Boca Raton Resort & Club, located midway between Palm Beach and Fort Lauderdale.

We stopped taking enrollments weeks before our last conference. To avoid being left out in the "old," complete the enrollment form on the back cover of this program and fax it to us at 508/872-0618. To enroll immediately, call us at 800/366-0246.

Regards,

Joseph L. Levy
Joseph L. Levy
President & Publisher

Lynda Rosenthal
Lynda Rosenthal
Vice President & General Manager
Executive Programs



Deann J. Shier



Deann J. Shier



Deann J. Shier



Creating a new paradigm requires that CIOs move to the next level above their departmental goals. They must commit to being businesspeople first by working directly from the corporate business plan.

Waves of Change

By Meghan O'Leary

The challenges of doing business in increasingly competitive, fast-moving and global markets are enough to test the skills of even the most business-savvy CIO. These challenges range from reengineering business processes to ruggedizing technical infrastructures. Companies intent on shaping the marketplace rather than merely reacting to it must prepare by marshalling and reevaluating their technical and human resources, with an eye toward long-term business goals.

From a management perspective, the buzzwords abound: reengineering, downsizing, outsourcing. They sound simple and effective, but creating a new corporate paradigm requires that CIOs move to the next level above their departmental goals. They must commit to being businesspeople first by working directly from the corporate business plan.

Nowhere is this mandate more imperative than in reengineering, according to Kathleen M. Taylor, vice president of CIGNA Systems division, which provides IS services for the CIGNA Companies. In 1989 Taylor began a systems-redesign project to determine why the company was getting only incremental improvements from technology. That project turned into a business-strategy reengineering project for an entire division and resulted in a dramatic 60 percent improvement in throughput and a 40 percent reduction in costs. Strategic reengineering allowed the division to eliminate some processes as well as some systems-development efforts that "didn't lend themselves to [the business] strategy. Reengineering, if it's done correctly, forces



Dick Luria/FPG

you into that kind of [activity]," Taylor explained.

Large businesses or divisions with more complex strategic plans and supporting processes may benefit from a combination of strategic and process reengineering, making small changes in support of the larger strategic overhaul. Experienced CIOs also recommend this approach for modernizing the business's entrenched technological base.

They agree that the key to migrating successfully to flexible, open systems is to focus on adding and coexisting, rather than razing and rebuilding. The PC and its attendant group of programming tools make this possible, according to Taylor, by allowing CIOs to build more flexible, responsive, functional networks on top of old-style mainframe systems. Thus they can migrate systems gradually to micro-computer platforms, reshaping the role of the mainframe instead of merely trashing it. You cannot have an effective competitive process that supports the business plan "if you've got to rewrite a whole backbone system," she said. "You've got to retool it."

"Change is the issue because it alters the power bases and comfort zones of people." Effective CIOs keep people uncomfortable because they are constantly initiating change. —Doug Nagan

Companies that want to enter new markets face a different set of problems in getting up to speed on the business plan. As president and CEO of Fireman's Fund of New Jersey (a subsidiary of Fireman's Fund Insurance Company) Chris Bluemer relied on outsourcing to help him start a separate auto insurance company and pick up 20,000 policyholders in a matter of six months. The parent company had been planning to drop its auto insurance activities; then New Jersey's government decided to get out of the business

and required all private auto insurance carriers in the state to pick up the abandoned policies. Bluemer's mission was to meet state requirements, consolidate FFNJ's current auto insurance activities, and build a separate, successful, \$75 million business that the company could sell off easily in two years.

"The worst thing to do [under those circumstances]," Bluemer said, "is to start incorporating the parent-company systems, the parent-company payroll and bureaucracy," no matter how open and advanced. "We basically have outsourced almost every service here—medical benefits, policy issue, customer information systems. It's better to rent a company than to start your own."

A Business-Savvy IS Staff

Bluemer's decision to outsource allowed him to further support the business plan by putting his money into hiring exceptional business staff rather than programmers. While most companies desire, and some already have CIOs with business skills, IS staffs with business skills are less common.

Since programmers are not generally promoted because of their business and political expertise, business-savvy technical staff-

ers are more likely to be made than found, according to Doug Nagan, senior vice president and CIO for publisher John Wiley and Sons, Inc., in New York. Many CIOs are forming partnerships between their staffs and those of the divisions they support in order to facilitate this transformation.

Paradigm shifters should look outside their own fields for ideas. They should ask, "What is currently impossible to do in my field but, if possible, would fundamentally change it?"

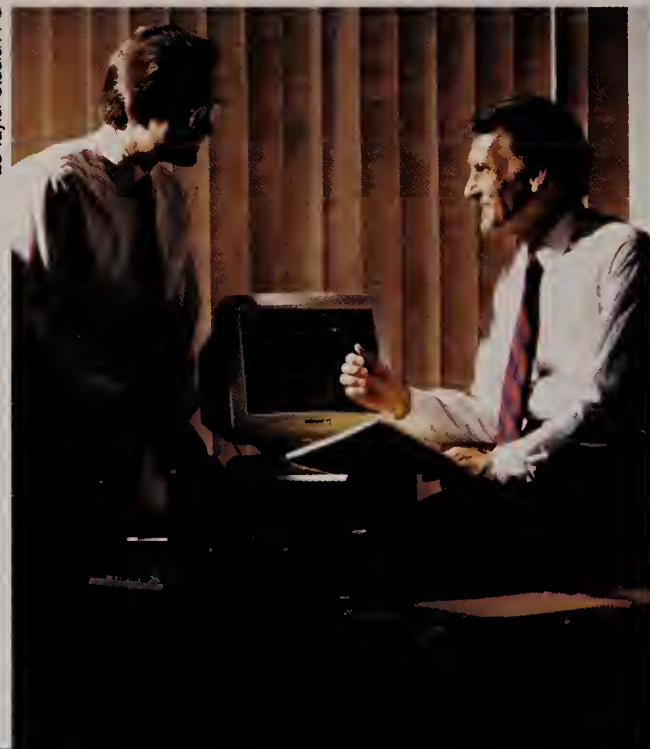
One potential ready-made labor pool, according to both Taylor and Nagan, is the white-collar professional workforce. PCs, client/server computing and PC-based development tools have created a new breed of businessperson, well-grounded in technology and at least somewhat familiar with systems design. Many of these workers already use various PC programming tools to create reports and applications. Taylor believes that the time is ripe to hire these people as IS staff.

Although they are not ready to take us-

Lou Jones/Image Bank



Ed Taylor Studio/FPG



ers on as staff, executives like Fred Winograd, Merrill Lynch's head of technology planning, see another means of tapping into that pool. They are giving users more tools that allow them to meet their own programming needs, thus taking some of the pressure off the IS group. Winograd compares his solution to long-distance direct dialing—AT&T's smart substitute to hiring millions of operators.

Until they can harness the growing technical strength of users, CIOs would be well advised to keep a close eye on them, according to consultant Portia Isaacson, president of Dream IT in Cambridge, Mass. These professionals are experiencing new power and independence, enabled by better tools and smaller, more mobile desktop technologies such as laptops and palm computers. CIOs must find new ways to partner with and manage this emerging group of power users, while planning for the shifts such mobilizing technologies will necessitate in managing the network.

A picture of the future of corporate IS is readily available; yet change is slow in coming. Why? Because people don't like change, says Wiley's Nagan. Nagan is fond of quoting the 16th century political philosopher Niccolo Machiavelli: "It must be remembered that there is nothing more difficult to plan, more

Art Montes de Oca/FPG



doubtful of success, nor more dangerous to manage than the creation of a new system, for the initiator has the enmity of all who would profit by the preservation of the old institutions and merely lukewarm defenders in those who would profit by the new ones."

CHANGING PARADIGMS

Joel Barker, a self-proclaimed "process futurist" and founder of Infinity Ltd, Inc., in Minneapolis, is the father of the overused but under-comprehended phrase "paradigm shift." The author of a book on the subject (*Future Edge*), Barker has spelled out four rules that govern the process:

RULE ONE: The next paradigm shift in your business is likely to show up well before you're ready for it. This is exemplified by the early Apple and Radio Shack PCs that sold only to electronics hobbyists.

RULE TWO: Paradigm shifts tend to be introduced by people who don't know your business. The publishing industry didn't invent the personal data disc player—the likely format for magazines of the future—Sony did.

RULE THREE: The people who change paradigms do so with more courage and intuition than market data.

RULE FOUR: Making the shift means changing the rules. For example, the Japanese have historically changed paradigms by perfecting a number of American inventions.

Barker advises potential paradigm shifters to look outside their own fields for ideas. They should ask, "What is currently impossible to do in my field but, if possible, would fundamentally change it?" and also anticipate the positive and negative implications of a shift. Anticipating paradigm shifts can put a business two to three years ahead of its competitors. The problem is that "we have people who declare themselves as leaders who don't understand that the basic rule of leadership is risk," Barker said. "Leaders are people you follow where you won't go alone."

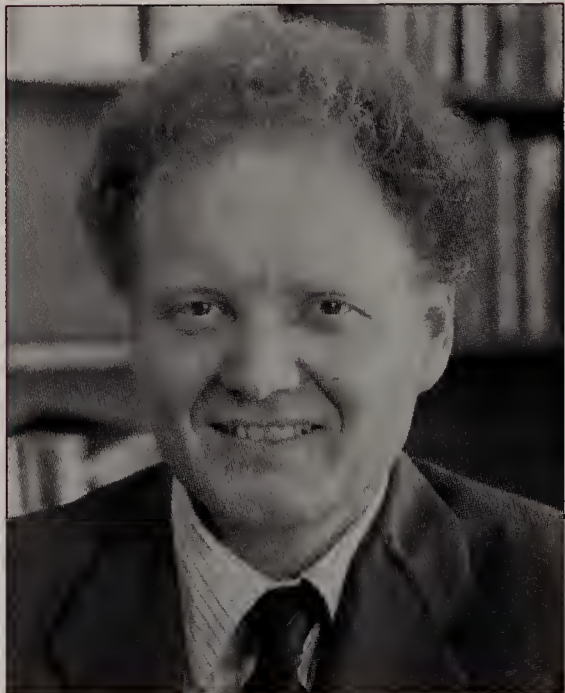
"Change is the issue," Nagan said, "because it alters the power bases and comfort zones of people." He believes that effective CIOs keep people uncomfortable because they are constantly initiating change.

The best remedy for a molasses-like corporate culture, he advises, is to go back to that business plan, this time via the CEO.

"The only way you can be successful is to find a way to understand what the CEO wants. If you're fortunate you find that the business-unit strategies are really in support of what he wants... and everybody views what you are doing as supporting them. This requires teamwork, the art of political compromise, the art of the possible." ■

Agenda

CIO PERSPECTIVES SERIES



Lester Thurow



DuWayne Peterson



Jim Wetherbe

SUNDAY, OCTOBER 11

2:00PM-6:00PM	Conference Registration
7:00PM-9:00PM	Networking Reception

MONDAY, OCTOBER 12

7:00AM-8:00AM	Continental Breakfast
8:00AM-8:30AM	Welcome & Opening Remarks Joseph L. Levy, <i>President & Publisher CIO Publishing Inc.</i> Conference Moderator: Jim Wetherbe <i>Director, MIS Research Center & Professor of MIS Carlson School of Management University of Minnesota</i>
8:30AM-9:55AM	Head to Head: The Coming Economic Battles among Japan, Europe & America Lester Thurow <i>Dean, MIT Sloan School of Management Economist & Author</i>

In the next half century, the world economy will be a competitive-cooperative game where the clear distinctions between teammate and opponent will have vanished. The game will be played with new rules and involve new participants who approach capitalism in communitarian ways quite different from the individualistic practices of the Anglo-Saxons. At the same time, a series of technological revolutions are fundamentally changing the relative importance of natural resources, capital, technology and skills in sustaining economic prosperity.

9:55AM-10:25AM	Coffee Break
10:25AM-11:55AM	Turning On the Power Station: Pioneering the New Operating Model Panel Moderator: DuWayne Peterson <i>Chairman, DuWayne Peterson Associates</i>

The current "service station" operating model for IT delivery is dead. A "power station," fueled and owned by the entire management team, is the model for managing IS in the '90s. But how do we get there? The challenge is to take research and insight into the new operating model, affirm it and make it happen in the real world. What are the steps required? What are the obstacles and how can we overcome them? Is anyone operating a power station yet? What should we salvage from our old way of managing IS? An Implementation Task Force of prominent CIOs, facilitated by Booz Allen & Hamilton and chaired by DuWayne Peterson, former CIO of Merrill Lynch, will tackle these issues.

12:00PM-1:30PM	Luncheon
1:30PM-4:30PM	Networking & Affinity Groups Various small group, facilitator-led discussions and recreation

THE PROCESS OF IT: ORGANIZING FOR SUCCESS

October 11-14, 1992, Boca Raton Resort & Club, Boca Raton, Florida

MONDAY, OCTOBER 12 (CONTINUED)

Affinity Groups
(Additional Affinity Groups will be available at the conference)

Creativity in Business: A Formula for Success

Jim Young, Assistant to the Chairman
EDS

The founder and honorary chairman of Sony, Masaru Ibuka, recently was quoted as saying, "The key to success for Sony, and to everything in business, science and technology, for that matter, is never to follow the others." By applying creativity tools and techniques, we can become leaders of our industries and in our companies. This session will explore some of these tools and their applications.

Developing a Corporate IT Architecture

Dr. Lonnie Spund
Chief Information Systems Architect
Apple Computer

6:30PM-7:30PM

Reception

7:30PM-10:00PM

Dinner on the Beach



Jim Young



Doug Nagan

TUESDAY, OCTOBER 13

7:00AM-8:00AM

Continental Breakfast

8:00AM-8:50AM

**The Politics of IT:
The Machiavellian CIO**

Doug Nagan, Senior Vice President & CIO
John Wiley & Sons

Technology and business processes occur within a complex set of relationships, environments and priorities, with many conflicting objectives. At the same time, our enterprises are political systems consisting of individual constituencies with specific requirements, beliefs and objectives. Like politicians seeking office, we need to gain the endorsement and support of these various constituencies. Managing change is key, because change alters power structures and intrudes upon people's comfort zones. What do CIOs as change-makers need to do to understand the inherent difficulties in making people embrace change, and how can we facilitate the process? We will examine the role of the hero, the art of the possible, and developing our own constituency.

8:50AM-9:40AM

**The Value of Process Redesign:
Seizing the Customer Moment**

Tom Harbison, Chairman & CEO
Neodata

Too often, IT simply reacts to specific situations without improving underlying processes. Neodata—the nation's largest fulfillment house, providing magazine subscription and book fulfillment, telemedia services and other direct-marketing services—accounts for two percent of the nation's annual postal volume. Despite its size, Neodata seeks to optimize each and every customer contact—no small task for an organization with more than 130 million customers. Chairman and CEO Tom Harbison will relate how Neodata used IT to fundamentally redesign its approach to customer service.



Tom Harbison

Agenda

CIO PERSPECTIVES SERIES



Chris Bluemer



Kathleen Taylor



Larry Tieman

TUESDAY, OCTOBER 13 (CONTINUED)

9:40AM-10:10AM

Coffee Break

10:10AM-11:00AM

Is Client/Server Computing Ready for Prime Time?

Fred Winograd, *Vice President
Distributed Applications Planning
Merrill Lynch Inc.*

Client/server technology must be sufficiently advanced before most companies will be willing to forgo their existing commitments to mainframe platforms and build for the future with a distributed-processing environment based on client/server architected LANs. The issues that will determine client/server's readiness for prime time include being able to control data security and provide end users with the graphical user interfaces they demand without risking "data anarchy" at the workstation level; the availability of secure, fast, sufficiently robust relational databases; and LAN administration and speed.

11:00AM-11:50AM

Using Outsourcing to Realize the Corporate Mission

Chris Bluemer, *President & CEO
Fireman's Fund of New Jersey*

Providing automobile insurance in New Jersey requires the ability to respond quickly to anticipated surges in business activity, and that requires effective information technology. But building internal systems takes time—something the Fireman's Fund of New Jersey didn't have. "Renting" the technology and systems is one way in which outsourcing can be used to solve some of the speed-to-market barriers.

12:00PM-1:10PM

Luncheon

1:10PM-2:00PM

Winning through Reengineering: A Strategic, Not Systems, Concept

Kathleen Taylor, *Vice President
CIGNA Systems
CIGNA Companies*

The business motivators that drive reengineering require corporate-wide planning, and acknowledgement that reengineering is not solely a systems concept. CIGNA has successfully reengineered 13 business divisions. Vice president of CIGNA Systems Kathleen Taylor will discuss the lessons learned and the critical success factors that ensured that success and enabled CIGNA to remain competitive.

2:05PM-3:00PM

Concurrent Sessions

Reengineering Product Development for the '90s

Larry Tieman, *Chief Technology Officer
Nielsen Marketing Research*

The business climate of the '90s presents enormous challenges for product development. Organizational structure is changing, with flatter organizations, outsourcing, networked enterprises, self-directed teams and dispersed organizations all part of the new mix. New technical issues—object-oriented development, knowledge-based systems, client/server architectures, downsizing—are emerging. Underlying all these changes are an increasingly diverse workforce and the challenges of providing advancement for technical-track personnel. A successful product-development organization must reengineer to meet these challenges head-on.

THE PROCESS OF IT: ORGANIZING FOR SUCCESS

October 11-14, 1992, Boca Raton Resort & Club, Boca Raton, Florida

TUESDAY, OCTOBER 13 (CONTINUED)

2:05PM-3:00PM

Not Just Another Quality Story

Tom Repede, *Director of Corporate Quality
Computer Associates*

You've probably heard about Total Quality Management. If your organization hasn't already started a major quality initiative, chances are good that it will soon. You may hope to one day win the coveted Malcolm Baldrige National Quality Award, or you may just use its criteria as guideposts. But is TQM a passing craze? Can it succeed in your organization? In what ways will IS be called upon to assist other departments in the enterprise, and what does it mean for IS to practice TQM? This session will provide direct answers and practical advice. You'll learn how the seven criteria of the Baldrige award can be applied to IS, and you will see how IS can support the rest of the organization in practicing TQM.

IT: the Driving Force of Business Process Redesign

Dr. Keith Short, *Director of IEF Research
Laboratory & Research Director
JMA Information Engineering Ltd.
Texas Instruments*

There is a good fit between the basic business modeling concepts of Business Process Engineering (BPE) and Information Engineering (IE). IE, on the one hand, requires greater detail consistent with the objective of producing information systems, whereas BPE embodies additional, higher levels of abstraction consistent with the objective of optimizing business performance. Dr. Short will address the relationship between information technology and business process redesign.

Implementing Worldwide Workgroup Computing

Gene Cort, *Vice President
Information Systems & Support
Lotus Development Corporation*

The architecture of the '90s must integrate structured data from mainframe, mini and PC-based transaction systems, store it in "data warehouses," and deliver it to managers' desktops. Lotus's IS department developed a state-of-the-art management information system that gets IS out of the report-writing business and keeps Lotus executives informed.

3:00PM-3:30PM

Coffee Break

3:30PM-5:30PM

DoD and IT: Declining Budgets, Increased Expectations

Paul Strassmann, *Principal Deputy
Assistant Secretary of Defense for C3I
Department of Defense*

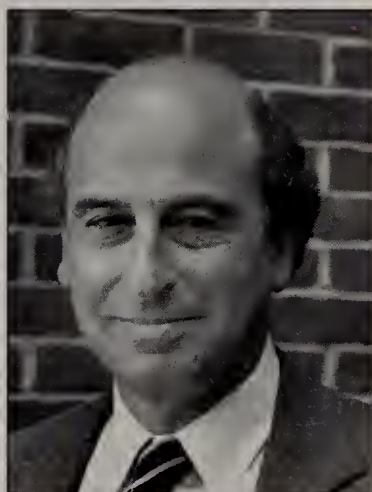
With an annual IT budget in excess of \$20 billion, the Department of Defense is the world's largest information processing organization. Its Corporate Information Management (CIM) program is designed to systematically redesign its information systems while its resources are cut by about one-third. CIM has introduced a financial-management process for assuring enterprisewide integration, a design doctrine based on rapid deployment of information resources in the battlefield, a business-process modeling standard, a commitment to open systems, a software re-use organization, a new technique for justification of IT investments, and an organizational structure that redefines the relationship between operating and technology staffs. Systems integration and interoperability are now an essential core competency at DoD. A discussion of the principles that guide the present restructuring provides a dramatic look at how a giant organization copes with the management of change.



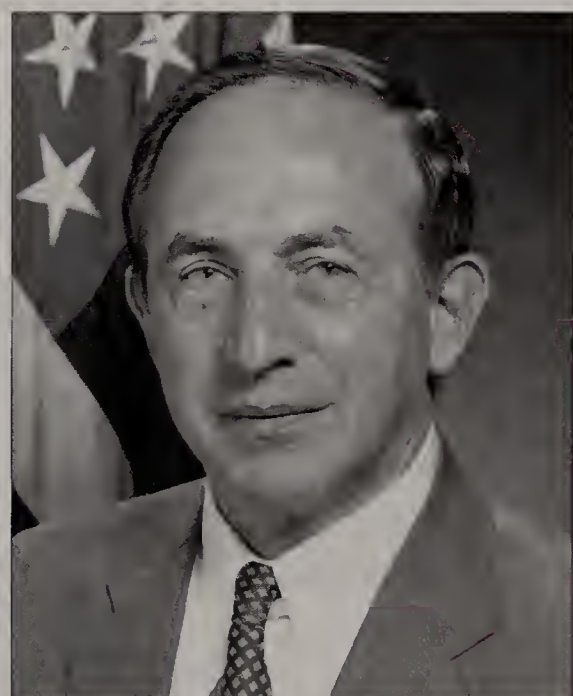
Tom Repede



Dr. Keith Short



Gene Cort

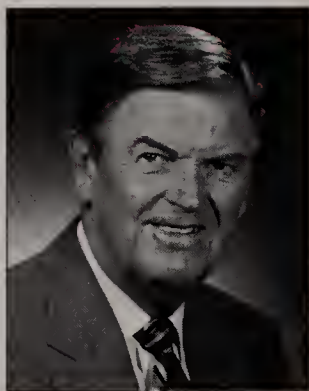


Paul Strassmann

Agenda



Marcia Blumenthal



James K. Hull



John W. White



Debi Coleman



Michael C. Fischer



Kevin W. Moody

CIO PERSPECTIVES SERIES

TUESDAY, OCTOBER 13 (CONTINUED)

5:30PM-6:30PM

Reception with Paul Strassmann

WEDNESDAY, OCTOBER 14

7:00AM-8:00AM

Continental Breakfast

8:00AM-8:40AM

IT: The Enabler of Business Process Change

Moderator: Marcia Blumenthal
Editor-in-Chief, CIO Magazine

Larry Tieman, *Chief Technology Officer*
Nielsen Company

James K. Hull, *Vice President*
Information Systems & Services
NCR Corporation

John W. White, *President*
Information Technology Group
Texas Instruments

Whether the product is manufactured goods or services, today's organization has to be more flexible to become a high performance competitor. Three IT executives will share their strategies for enabling business process change in their organizations.

8:40AM-9:20AM

Building a Dynamic Information System

Debi Coleman, *Vice President*
Information Systems & Services
Apple Computer

The client/server environment requires a new conceptual framework and architecture to build a modular corporate information system. A comprehensive, vendor-independent planning guide and blueprint for system design is required to create and maintain a resilient infrastructure.

9:20AM-10:15AM

Concurrent Sessions

Driving Business Performance by Leveraging Resources

Michael C. Fischer
Division Vice President, Consulting
EDS

As companies continue to invest in information technology, they increasingly demand enhanced business performance as a return on their investments. Business Information Planning facilitates the process of determining the business value of IT, identifying business requirements and aligning technology to support and achieve strategic business goals. This organized approach ensures that limited human, technology and capital resources are leveraged and applied according to business priority in ways that contribute most to future business needs.

The Top Ten IS Management Challenges for the '90s

Kavin W. Moody, *Senior Vice President*
Technology Investment Strategies
Corporation

Not long ago, many information executives prospered by simply aligning themselves with a big successful vendor. But with the existence of

THE PROCESS OF IT: ORGANIZING FOR SUCCESS

October 11-14, 1992, Boca Raton Resort & Club, Boca Raton, Florida

WEDNESDAY, OCTOBER 14 (CONTINUED)

proprietary strongholds becoming a thing of the past, and with one out of every three CIOs losing his or her job each year, all that has changed. This session will focus on the top ten IS challenges facing IT executives.

9:20AM-10:15AM

LANs and WANs: The Marriage for the Next Century

Bob Steinkrauss, *Senior Vice President & General Manager*
LAN Internetworking Division
Racal-Datacom

Harmony between LAN and WAN strategies is essential to corporate success. Yet the issues of cost, control and compatibility can disrupt that harmony. Speed is acknowledged as the most important factor when considering LANs, while cost is the major issue with WANs. Making a successful marriage between these two is the challenge for successful enterprises.

Getting Started: Why Not Reengineer the IS Process Itself?

Ed Jebber, *Assistant Vice President*
Information Systems & Services Group
NCR Corporation

Today's organizations are moving from the collection of data to the management of information. Implementing an open computing environment enables you to leverage your existing investment while providing a pathway for improving data and information handling in the future. These strategies can make your IS organization more effective by capping mainframe development and using new technology to reduce the programming backlog, thus making information systems more responsive and your organization more effective.

Pushing A Rope Uphill: Implementing Client/Server Computing in Your Organization

Carl Schulz, *Vice President*
Software Development
GTE Data Services

One of the key issues for companies moving to open systems, Unix and client/server architectures, is the impact such changes will have on their IS organizations. IS executives must analyze and alter their existing organizations to meet the challenges of open systems, OOD and client/server. In addition, the new environment creates a variety of issues that will make new demands on the classical mainframe developer, and that must be resolved prior to implementation. For IS executives, the challenge is to marry the new and legacy systems in a seamless and consistent manner, while building a strong foundation of operations based on the IS organization's "best practices" and industry standards.

10:15AM-10:35AM

Coffee Break

10:35AM-12:00PM

Never Mind What You Know; What Do You Believe?

Robert Fulghum, *Author, Minister,*
Sculptor, Conductor & Existentialist

A philosopher's point of view from the year 2192, drawn from what was happening in the years 92, 992, 1892, 1992 and 2092, and taken from that place where the bottom line, the big picture, making a living and making a life intersect.



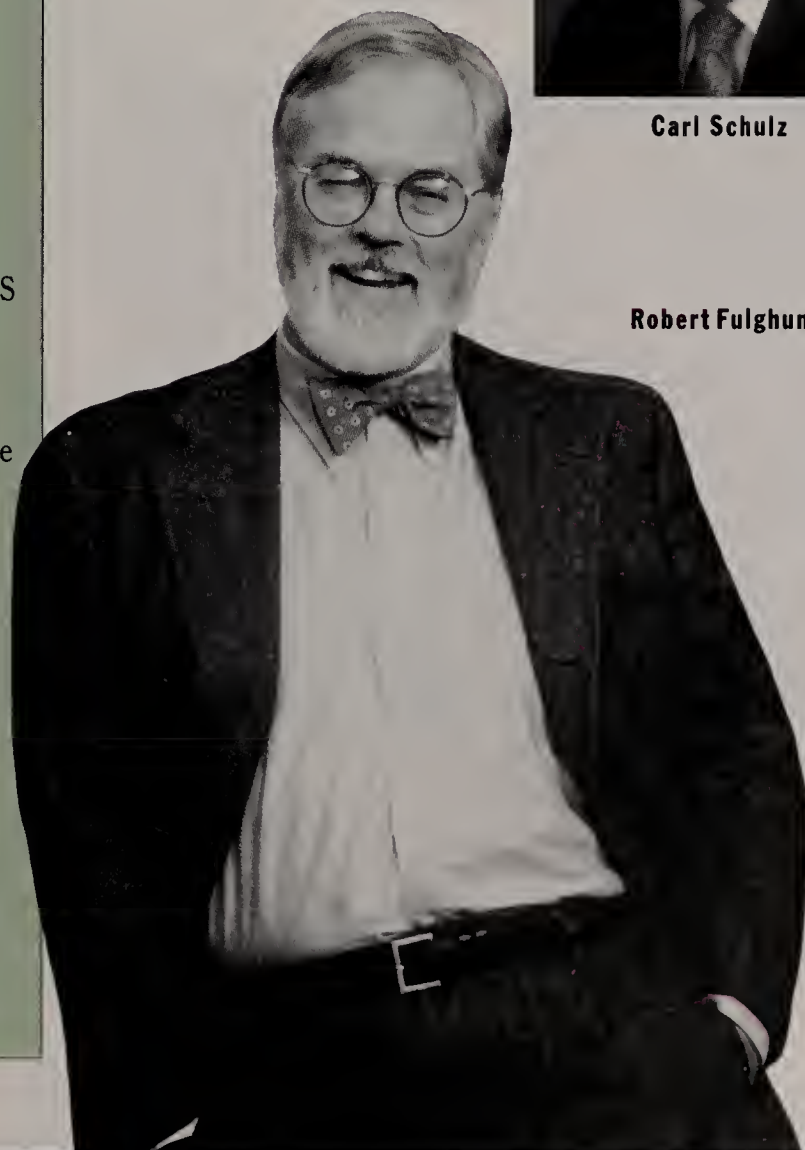
Bob Steinkrauss



Ed Jebber



Carl Schulz



Robert Fulghum

Companion Program

This program is designed to allow companions to explore the sights of Boca Raton during the conference and join the participants for meals and social activities. A companion breakfast is scheduled for Monday morning to give everyone a chance to meet. Your CIO companion guide will greet you, review the planned activities and answer questions. After joining the conference participants for lunch, companions will tour the Loxahatchee Everglades, Florida's wetland habitat of rare and endangered species. This tour includes a narrated airboat ride through the Loxahatchee National Wildlife Refuge, a wildlife presentation featuring "up-close" encounters with inhabitants of the Everglades, and an environmental nature walk. Tuesday morning starts with a trip to the Henry M. Flagler Museum (Whitehall Mansion), former home of the cofounder of the Standard Oil Company. The museum is the magnificent 54-room mansion Mr. Flagler built for his wife in 1901; the rooms have been carefully restored to reflect the opulence of the era. "Whitehall" has been placed on the National Register of Historic Places.

After the museum, a shopping excursion to Worth Avenue, the premier shopping avenue of Palm Beach, is scheduled. We will return to the hotel in time for Paul Strassmann's keynote presentation, followed by a reception with Mr. Strassmann.

We've extended the Monday afternoon program to include all conference attendees, who must sign up in advance.

Companions must be enrolled in this program to participate in any of the conference functions, meals or sightseeing. Enrollment in this program does not include conference-session attendance.

Deann J. Shier



Deann J. Shier



SUNDAY, OCTOBER 11

7:00PM-9:00PM Networking Reception

MONDAY, OCTOBER 12

9:00AM-10:00AM Companion Breakfast
12:00PM-1:30PM Luncheon with Conference Participants
1:30PM-5:00PM Loxahatchee Everglades Tour
6:30PM-7:30PM Reception
7:30PM-10:00PM Dinner on the Beach

TUESDAY, OCTOBER 13

7:00AM-8:00AM Breakfast with Participants
9:30AM-11:30AM Henry M. Flagler Museum Tour
12:00PM-3:00PM Worth Avenue Shopping
5:30PM-6:30PM Reception with Paul Strassmann

WEDNESDAY, OCTOBER 14

7:00AM-8:00AM Breakfast with Participants

Boca Raton Resort & Club



The five-star Boca Raton Resort & Club on Florida's Gold Coast is ideally situated between the Intracoastal Waterway and the Atlantic Ocean. Located on a 223-acre estate, it is one of the world's premier resorts and has won virtually every prestigious hospitality, dining and meeting honor.

Casual is the operative word at the Boca Beach Club, where stylish rooms overlook the ocean or the Intracoastal Waterway. The club is located on its own half-mile beach and features colorful, private beach cabanas, excellent restaurants and informal nightly entertainment.

Boca has two championship golf courses and 29 clay tennis courts on which single, double and round-robin tennis tournaments are a daily activity. The resort has a 23-slip marina with sailing, powerboating, parasailing and fishing available. There are four indoor racquetball courts, a croquet course, basketball court and two fitness centers.

Special programs are available for children aged three through five and six through twelve: These can be arranged on a daily basis. Baby-sitting can also be arranged.

BOCA RATON, FLORIDA

A tropical paradise with an average temperature of 76 degrees, beautiful beaches, year-round sunshine and a variety of activities, Boca Raton is equidistant from Fort Lauderdale and Palm Beach.

Boca Raton is a versatile city, offering something for every taste. For sports enthusiasts, the 25 golf courses and tennis facilities rank among the best anywhere. A day at the beach might include swimming, snorkeling, waterskiing, scuba diving and fresh- or salt-water fishing.

For those who appreciate the finer arts, Boca Raton and neighboring communities boast renowned museums and galleries: the Henry M. Flagler Museum (Whitehall Mansion), the Norton Gallery of Art, and the Society of the Four Arts. Dinner-theater productions and a wide variety of musical performances and concerts also take place nightly.

Boca Raton's abundance of shops and restaurants will satisfy the most avid shopper and discriminating gourmet. And everyone will enjoy horse racing, greyhound racing, polo, jai-alai, horseback riding, bicycling, sailing and sportfishing.



Corporate Hosts



APPLE COMPUTER

Apple Computer Inc. develops, manufactures and markets personal computer systems for use in business, education, science, engineering and government. A recognized pioneer and innovator in the personal computer industry, Apple does business in more than 120 countries. Apple has redefined computing to mean empowerment of the individual. It seeks through technology to provide people with easy and affordable access to information and computing power.

BOOZ·ALLEN & HAMILTON

BOOZ ALLEN & HAMILTON

Booz Allen & Hamilton is a global management and technology consulting firm dedicated to helping senior executives improve the performance of their institutions. Following the firm's Strategy-Driven Systems approach, Booz Allen professionals combine top-down management perspective with hands-on systems integration expertise to plan, develop and implement systems that change the way clients do business.



COMPUTER ASSOCIATES

Computer Associates International is the leading independent software company in the world. CA develops, markets and supports integrated systems management, information and business applications software for a broad range of mainframe, midrange and desktop computers. CA serves the international marketplace through offices in 26 countries.



TAKE ADVANTAGE OF CHANGESM

EDS

EDS is a leader in applying information technology to the needs of businesses and governments worldwide. Dallas-based EDS has spent 30 years helping customers achieve their business objectives. The company provides the following services: consulting, systems development, systems integration, systems management and process management. With operations in 30 countries, EDS has more than 70,000 employees. The company posted 1991 revenues of \$7.1 billion.



HEWLETT-PACKARD

Hewlett-Packard Company is an international manufacturer of measurement and computation products and systems recognized for excellence in quality and support. The company's products and services are used in industry, business, engineering, science, medicine and education in approximately 100 countries. HP has 89,000 employees and had revenues of \$14.5 billion in its 1991 fiscal year.



LOTUS DEVELOPMENT CORPORATION

Lotus Development Corporation, founded in 1982, provides software applications and services that meet the evolving technology and business needs of individuals, workgroups and entire organizations. During the 1980s, Lotus built its success by delivering innovative productivity tools to individuals using personal computers. With the introduction of Lotus Notes, a group collaboration software for networked PCs, the company is delivering applications in an open workgroup environment and addressing the primary imperatives for computing in the 1990s—networking and organizational computing.

NCR CORPORATION

NCR Corporation, the networked computing resource of AT&T, develops, manufactures, markets, supports and services enterprisewide information systems for worldwide markets. A product line based on an open, cooperative computing architecture and the NCR System 3000 line of computers meets the information processing needs of customers in a wide variety of markets, including retail, financial and general purpose. NCR products are sold through 1,100 offices in more than 120 countries. NCR has 55,000 employees worldwide.



NIelsen MARKETING RESEARCH

Nielsen Marketing Research (NMR) is the world's leading marketing information services company, with offices in 28 countries. NMR is dedicated to providing customers with the highest quality information and decision support services using AI-based software, visual programming environments, EIS and ad hoc analysis and delivery systems. From its world headquarters in Northbrook, Illinois, Nielsen supplies a wide range of services and technologies that help consumer-goods manufacturers and retailers develop insights to make better business decisions.



RACAL-DATACOM

Racal-Datcom, a global union of 15 companies in 10 countries, is one of the world's leading independent providers of data communications products, systems and services. It is committed to supplying a broad range of integrated data communications technology and professional services capabilities that positively impact its customers' business goals. Racal-Datcom is supported by its U.K.-based parent company, Racal Electronics Plc., a more than \$2.5 billion multinational firm, which owns in excess of 100 principal electronics companies worldwide.



TECHNOLOGY INVESTMENT STRATEGIES CORPORATION

Technology Investment Strategies Corporation helps corporate executives and managers around the world make their strategic business decisions about information technology. As a subsidiary of International Data Group (IDG), the world's leading provider of information on IT, TISC is well connected to the largest global network of information resources. TISC draws from this vast information network, spanning 49 countries, to provide its clients with a comprehensive set of research and consulting services dealing with the most critical information technology management issues of the day.



TEXAS INSTRUMENTS

Texas Instruments Incorporated, the I-CASE technology leader, is a high-technology company with sales and manufacturing operations in more than 30 countries. TI develops, manufactures and markets semiconductors, defense electronics systems, software productivity tools, computer systems and peripheral products, custom engineering and manufacturing services, electrical controls, metallurgical materials and consumer electronics products. At Texas Instruments, technological leadership and persistent commitment to quality have been the keys to success.





ENROLLMENT FORM

Please complete this form in its entirety. Thank you.

Name _____

Title _____

Company _____

Address _____ Mail Stop _____

City _____ State _____ Zip Code _____

Phone () _____ Fax () _____

What industry are you/your company in? _____

Your name as you want it to appear on your badge: _____

Name of Companion (if attending): _____

Additional Company Enrollment

The following people from my company also plan to attend:

Name _____ Companion _____

Title _____ Mail Stop _____

ENROLLMENT FEES

(Please include a business card.):

PRIOR TO JULY 31, 1992

IS Practitioners/Executives: If you are a CIO, IS executive or hold another executive non-sales/marketing position, the fee is **\$995**.

Government/Military: The fee, which includes your hotel for three nights, is **\$1,395**.

ON/AFTER AUGUST 1, 1992

IS Practitioners/Executives: If you are a CIO, IS executive or hold another executive non-sales/marketing position, the fee is **\$1,195**.

Government/Military: The fee, which includes your hotel for three nights, is **\$1,595**.

If you do not qualify for one of the above categories, the enrollment fee is **\$2,250**.

All enrollment fees must be paid in advance of the meeting. Fee includes conference sessions, affinity group and break-out sessions, corporate host displays, conference materials and scheduled food and beverage. Transportation and hotel are your responsibility.

PAYMENT INFORMATION:

☐ Check Enclosed ☐ Bill Company

☐ Credit Card ☐ P. O. #

☐ AMEX ☐ VISA ☐ MC Exp. _____

Card # _____

Signature _____

FAX, CALL OR MAIL TO:

Fax to 508/872-0618; call us at 800/366-0246 or mail to: CIO Magazine, 492 Old Connecticut Path, Framingham, MA 01701. Attn: Executive Programs

COMPANION PROGRAM: \$185

Companions must be enrolled in this program to attend any conference-related functions. (Includes all scheduled food and beverage functions, and two planned companion program activities. It does not include conference session attendance.)

HOTEL ACCOMMODATIONS:

A block of rooms has been reserved at the five-star Boca Raton Resort & Club. We urge you to make your reservations early by calling the

hotel at 800/327-0101. Be sure to identify yourself as part of the CIO conference to receive the conference rate. Hotel reservations/cancellations and charges are your responsibility, except for government/military participants.

ATTIRE:

Casual! Please, no suits, ties or business attire!!

TRANSPORTATION:

American Airlines/Delta Airlines are the official conference carriers. Depending on your originating city, you can qualify for up to a 45% discount. Call American at 800/433-1790 and reference Star File #SO204S, or call Delta's Special Meetings Network at 800/221-1212 and reference File #B41084.

Shuttle bus transportation is available from Palm Beach and Fort Lauderdale airports.

☐ Check here for information on the children's program.

CANCELLATION:

You may cancel your enrollment up to 9/11/92 without penalty. Cancellation between 9/12 and 10/8 will receive full credit toward attendee at the next conference. No refund or credit will be given for cancellations received on or after 10/9, or for no-shows. You may send a substitute in your place.

NETWORKING/AFFINITY GROUPS:

A variety of activities is being planned for Monday afternoon. Please identify special interest group or affinity group sessions you are interested in attending:

OTHER ACTIVITIES:

Which Monday afternoon activities are you interested in?

☐ Golf ☐ Tennis ☐ Fishing



The basic one-year subscription rate for CIO magazine is \$94.

Subscribe And Save.

~~\$94*~~ **\$59**

Yes, enter my one-year subscription to *CIO* magazine and bill me later for only \$59, a savings of over 37% off the basic rate.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

**This is a domestic rate only (Canada & US). The foreign rate is \$175 US.* 692

**PROCESS
IMMEDIATELY**



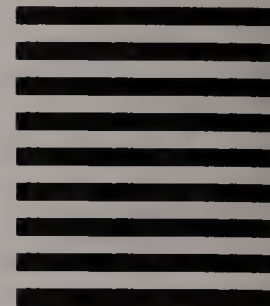
NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS MAIL PERMIT NO. 1020 FRAMINGHAM, MA

POSTAGE WILL BE PAID BY ADDRESSEE

CIO Magazine
Attn: Circulation Department
P.O. Box 9208
Framingham, MA 01701-9900



JUSTIFYING TECHNOLOGY

THE BURDEN OF PROOF

Budget-conscious companies aren't interested in best guesses or pie-in-the-sky promises when it comes to justifying investments in technology. Rather, they demand hard, objective measures that reflect corporate goals and user requirements. A number of emerging methodologies promise to arm CIOs with the figures they need to make smart business decisions and the evidence they need to sell those decisions to management. CIO senior writers Thomas Kiely and Richard Pastore explore several such methodologies and describe how business is at long last welcoming the metric system.

The Measure Hunt

CIOs need concrete measures they can use to estimate the value of technology, manage implementations and audit the benefits of delivered systems. Many observers believe these new measures must combine financial and business yardsticks—and that they should stem from the strategic goals of the organization and the business needs of customers.

PAGE 60

Many Happy Returns

Information Economics quantifies intangible benefits, ranks proposed projects by their expected contribution to business objectives and casts users in the role of project sponsor. The net effect is new confidence in IS decision-making.

PAGE 66

The Users' New Clothes

"Customer focus is absolutely critical," according to David Edison of Westinghouse. "There has been a lot of disappointment in IT systems in the last few years, and that is in part the consequence of not getting customers to help define the value of systems."

PAGE 76

Not Measuring Up

CIOs are dissatisfied with the process of justifying, monitoring and managing systems investments, according to a recent survey by CIO and the Executive Insight Group.

PAGE 84



JUSTIFYING TECHNOLOGY

THE MEASURE HUNT

Hard times call for hard numbers, and senior executives are demanding that CIOs produce measures in stone rather than sand when justifying and prioritizing IT projects. Some new measurement methodologies can help.

BY THOMAS KIELY

There is no little irony in the realization that while technology is an excellent tool for capturing precise information and for indexing a broad array of values within a corporation, most organizations are dissatisfied with the measures they use to gauge the value of the technology itself. Few organizations would approve a project that bears no price tag, yet traditional financial measures are poor yardsticks for the intangible costs and benefits of new technologies. On the other hand, technology boosters tout the "strategic" value of technology but offer little hard evidence to back up their claims.

CIOs need concrete measures they can use to estimate the value of technology (in order to justify new initiatives), manage implementations and audit the benefits of delivered systems. Many observers believe these new measures must combine financial and business yardsticks—and that they should stem from the strategic goals of the organization and the palpable business needs of customers.

But how do senior managers concoct such a set of measures? A few emerging methodologies attempt to address this new vision

of value. Here is a sample:

Two years ago, Nolan Norton & Co., an IT consultancy based in Boston, along with several of the company's clients and a handful of academics, developed a performance-measurement system called the "balanced scorecard." Basically, the system's authors felt that managers rely too heavily upon financial measures when assessing corporate performance. Instead, these revisionists argued, managers should use a balance of four interrelated groups of operational and financial measures: the customer's view, an internal-process navel-gaze, an assessment of the company's ability to innovate and learn, and the shareholder's perspective.

For instance, measurements providing a customer's perspective of the company's performance could include defect levels, or the time it takes to fill an order. Internal business measurements might focus on the processes for making and delivering goods; innovation measurements could apply to the development cycle; and measurements from the stakeholders' perspective would be financial. Taken together, they provide a strategic glimpse of corporate performance and highlight targets to work toward.

Nolan Norton's consultants have adapted the scorecard for IT. "From an IT perspective, there is an over-focus on inter-



nal measures," said Senior Manager Sheila Cox. "The balanced scorecard helps an IT group to refocus on how to fit in with the business." In other words, a corporate scorecard would spotlight IS priorities and help to clarify the role that IS plays in each grouping, while a similar scorecard used within IS would provide a context for traditional internal measures (such as deliv-

ery time)—in balance with corporate strategic and financial concerns. The "learning" perspective, for IS, might include measurements for the use of new tools over time.

More specifically, the scorecard becomes a template for setting a value to IT systems, notes Charles Gold, the former measurements guru at IBM who is now head-

**CIOS NEED CON-
crete measures
to estimate the
value of technol-
ogy, and audit
benefits of de-
livered systems.**

PHOTO BY RALPH MERCER

**WHAT IF THE CABLE HELD
ONLY 99% OF THE TIME?**



WHEN YOU'RE 1000 FEET UP, 99% RELIABILITY BEGINS TO SOUND VERY SCARY. BE NO LESS CAREFUL WITH YOUR ONLINE BUSINESS SYSTEM. EVEN 1% DOWNTIME WITH YOUR CRITICAL APPLICATIONS CAN MEAN MILLIONS IN LOST REVENUES, BREAKDOWNS IN CUSTOMER SERVICE, AND SEVERAL NIGHTMARISH DAYS TRYING TO RESTORE CONTROL. STRATUS CONTINUOUSLY AVAILABLE SYSTEMS ARE DESIGNED TO BE UP AND RUNNING ALL THE TIME. THAT'S WHY DOZENS OF THE MOST RESPECTED CORPORATIONS IN AMERICA RELY ON US. FOR MORE INFORMATION ON THE SURPRISING COSTS OF COMPUTER DOWNTIME, CALL 1-800-727-3770.



Stratus

We never let you down.

JUSTIFYING TECHNOLOGY

ing up the metrics efforts of Ernst & Young's Total Quality Management for IS Leadership Program. "List your goals for each of these four perspectives, and then choose measurements to help you achieve those goals," he advised. While goals will vary among companies (since they are matched

RUBIN'S METHODOLOGY ALLOWS MANAGERS to monitor the progress of an implementation from multiple organizational perspectives—or across perspectives—in order to determine whether or not it will produce the sought-after values.

to the strategic needs of the business), generally value will be found in the adroit accomplishment of the right objectives; value encompasses (but is not limited to) ROI. For instance, a company might decide that IT's contribution to the corporate image holds value.

Howard Rubin, a software consultant based in Pound Ridge, N.Y., pushed the model even further by developing a pragmatic methodology for assessing the value of technology before, during and after an implementation. Rubin begins by analyzing each perspective, and defining the key elements of performance in each case. Managers can then develop a measurement system that would draw together the diverse financial, operational and strategic benefits of a planned initiative.

"Value is only produced if the outcome that was expected at the beginning of the project is generated when you deliver," Rubin said. He asserts that his methodology allows managers to monitor the progress of an implementation from multiple organizational perspectives—or across perspectives—in order to determine whether or not it will produce the sought-after values.

Some CIOs use another scheme, dubbed Information Economics, to justify and prioritize new system requests (see "Many Happy Returns" on Page 66). IBM helped to develop Information Economics, as well as another methodology that evaluates new technology initiatives based upon how much they contribute to a company's most strategically important business functions. Linda Goldberg, of IBM's consultant practices, notes that this sort of evaluation must begin with

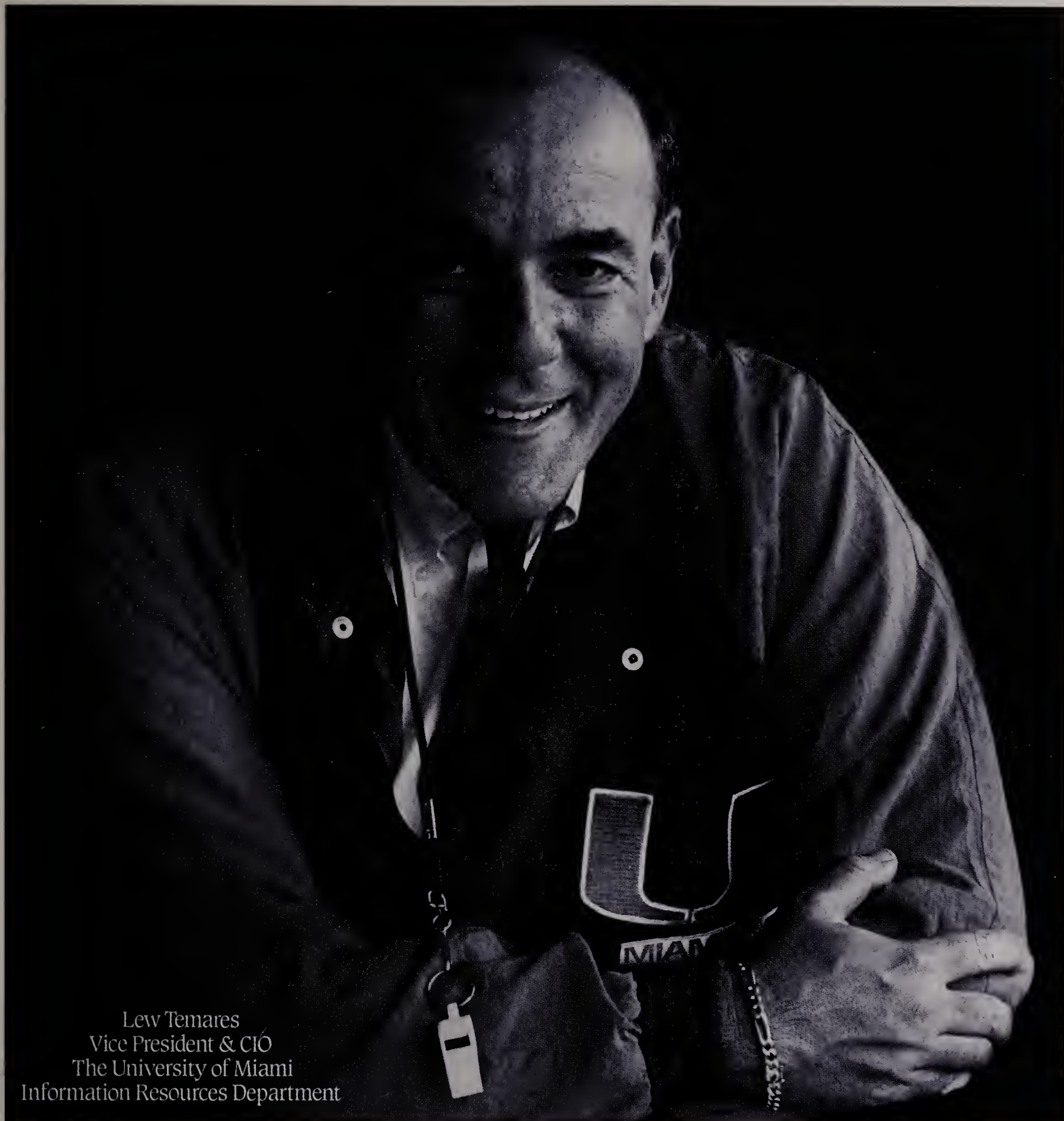
an analysis of the company's business strategies. Top management, working with IBM's consultants, develops a functional model of the enterprise and then prioritizes the company's business functions in light of each function's impact on key corporate strategies. This undertaking provides managers with a yardstick for rating the strategic value of new technology proposals.

All of the above strategies emphasize that value is derived from the links between technology and business. Two Boston-area academics parlayed this notion of value to develop a model that will allow IS managers to calibrate the course of an implementation. Kathleen Curley, an associate professor at Northeastern University's College of Business Administration, and John C. Henderson, director of the Systems Research Center at Boston University and professor of MIS in the university's School of Management, call their model an Impact Focus strategy. It uses the numerous and varied benefits (across the organization) that the corporation expects to receive from the technology as the touchstone, and highlights the benchmarks the system should meet if it is on track to deliver that value.

Henderson is also engaged in developing a very different—and quite unique—approach to technology valuation. Supported by grants from several major technology corporations, he and his colleagues are applying the financial theory of real options to what they see as the mutable, dynamic value of technology.

Some IT investments create flexibility in an organization, Henderson argues. For instance, a retooled architecture may create an IT environment where new applications can be developed more quickly, and with higher quality, than in the past. But how does a company place a value on this flexibility?

Henderson believes that a real-options framework—based on theories applied in financial markets—is a solution. The value of technology, like one's stock portfolio, isn't static. Changes in the business environment—which occur at accelerating speeds these days—can change the values of a new technology initiative repeatedly during implementation. Therefore, Henderson concludes, technology options should be managed such that the company continually revisits its decisions. CIO



Lew Temares
Vice President & CIO
The University of Miami
Information Resources Department

"Product quality. Technical excellence. Industrial-strength applications. Three simple reasons why Computer Associates has been my most important software vendor for more than 10 years."



CA's Computing
Architecture
For The 90s.

Service and support. Financial stability. They all matter a lot. But ultimately, what matters the most is the quality of the software itself.

Which is why 95% of the Fortune 500 choose CA software. We invest more in R&D every week — \$4 million — than the average software company earns in a year. And it shows. In a world filled with software crashes, CA software is a shining example of reliability. They call it mission-critical software. And we agree.

To us, every mission is.

**COMPUTER
ASSOCIATES**
Software superior by design.

JUSTIFYING TECHNOLOGY

MANY HAPPY RETURNS

Suppose you could subject your organization's portfolio of IT investment opportunities to an orderly justification process in which each was evaluated objectively in light of its probable contribution to key business objectives? Wouldn't that make everyone happy?

BY RICHARD PASTORE

Sometimes a system's benefit is like restaurant ice water: You can see it and taste it, and it clearly adds value to a dry pastrami sandwich. But it's hard to figure its exact worth, even if you were willing to pay for it. Likewise, it's tough to pin a dollar value on the obvious yet "intangible" benefits of proposed systems—things like competitive advantage, employee empowerment and management decision support. Making matters worse, distressed corporate officers are losing patience with fuzzy justifications; they want hard, objective numbers. Users too are continually disgruntled with the IS department and its seemingly arbitrary and unfair project prioritization process.

CIOs, their bosses and their customers might all find a solution in Information Economics (IE), a system of weights and measures that quantifies the intangible benefits and ranks proposed projects by their expected contribution to business objectives. The method casts users in the role of project sponsor, responsible for building sound business cases for their projects that can withstand tough but fair peer review. The



ROBERT BENSON: A WAY TO ACHIEVE IS-BUSINESS ALIGNMENT

net effect, CIOs say, is a new contentment and confidence in IT decision-making on the part of senior management and users.

The first step in the IE process is for top executives to lay out corporate objectives (both tangible and intangible) and assign to each a relative weight. For example, Sears Canada in Toronto has six stated business objectives: gaining competitive ad-



vantage, growing faster than the industry, improving customer service, enhancing product quality, empowering employees and achieving return on investment. Not surprisingly, ROI and customer service rank high, while employee empowerment and outpacing industry growth are weighted lower. Most companies choose from five to 10 business-objective categories, with multiple goals in each. In addition, companies should identify categories of risk, both business and technical, and weight these with negative numbers (see related story, Page 74).

"The degree to which these [objectives] are important will change from time to time, so they need to be reevaluated periodically," explained Robert Benson, dean of Washington University's School of Technology and Information Management in St. Louis. Benson codeveloped IE in the late 1980s in collaboration with Marilyn Parker, formerly of IBM and now principal at The Be-

ta Group Inc., a consulting firm in Raleigh, N.C., and Ed Trainor, vice president of IS at Southern California Gas Co. in Los Angeles.

In the second step of the justification process, proposed systems receive scores in each business objective (and risk category) based on their potential impact upon that objective. To use a simplified example, at Sears Canada a proposed voice-response system would score high in the customer-service category but low in employee empowerment, which it doesn't affect. Because customer service is weighted heavily at Sears, the voice-response system would receive priority over other projects that score lower in that objective. Similarly, if a competing project scored gangbusters in employee empowerment but fell short in customer service, it would likely lose out to the voice-response system.

For most IE users, ROI, payback period and other traditional metrics are only part—

CHARLES GRABNER: SENIOR CORPORATE OFFICERS ARE INVOLVED IN ESTABLISHING OBJECTIVES AND ASSIGNING VALUES TO EACH, AND REVISING THE VALUATIONS ANNUALLY.

PHOTO BY RON WATTS/FIRST LIGHT



IS FINDING WHAT YOU NEED TAKING MORE TIME THAN YOU HAVE?

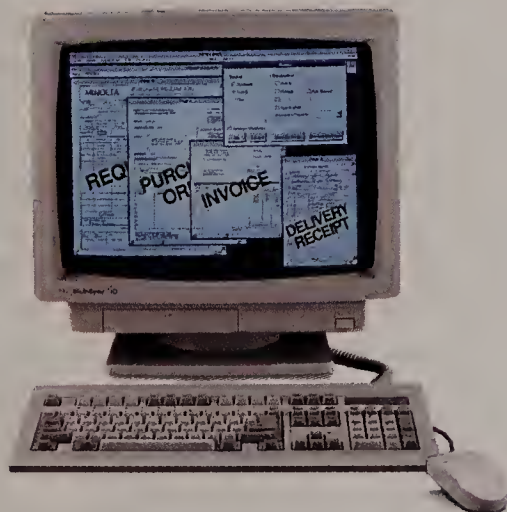
Your search is finally over.

Introducing MI³MS[®] 3000. Minolta's revolutionary new image management system. It accepts input from paper, microform, FAX and text files directly so you can collect, organize and use all of your document-based information simply and effectively.

It's easy to use, yet powerful enough to link your data to its original source. What's more, MI³MS 3000 operates under Microsoft[®] Windows[™] and will work with your other DOS and Windows programs, giving you local access to centralized data and images. There's even an application generator that allows you to tailor the system to your needs.

MI³MS 3000 gives you unprecedented power to make your whole business more organized, more streamlined, more efficient. In a word, more competitive.

To find out more, call 1-800-9-MINOLTA. The sooner, the better.



DOCUMENT IMAGING SOLUTIONS
ONLY FROM THE MIND OF MINOLTA



MINOLTA

JUSTIFYING TECHNOLOGY



RALPH RENNEKER: ON SOME PROJECTS, FULL STEAM AHEAD DESPITE "FUZZY" PAYBACK

albeit a very significant part—of the list of weighted objectives. Some IE users ascribe 25 to 60 percent of overall weight to ROI, but that's still a big change from the days when ROI accounted for 100 percent of a project's justification. For some projects, in fact, a good IE score in so-called intangible objectives can compensate for a low score in ROI. For example, noted Ralph Renneker, vice president of IS at Cincinnati Bell Telephone, "We started some initiatives for which payback was very fuzzy in dollars, but whose scores were high in strategic implications."

The third and final IE step is a peer-review process. Sponsors bring to the table their systems proposals and justification cases, with all the scores filled in. Their peers from other business units and the IS department evaluate the justification cases for errors or oversights. Many of these councils have sign-off authority for the proposed projects. Others pass their recommendations up to senior corporate management for final approval.

Besides its ability to quantify intangibles, IE's other big advantage is that it takes some of the political heat off IS by eliminating subjective prioritization. "[IS] doesn't

have to play the bad guy and say we're not going to do your project because it's not important enough," said Lynwood Walker, systems planning adviser in the network development division of AGT Ltd., Alberta, Canada's telco carrier. IE's objectivity also eliminates the unfair advantage for the squeaky wheel. "In the old days, whoever could yell and scream the loudest would get their project built," Walker said.

Indeed, users can now blame no one but themselves if their system requests get torpedoed. Perhaps as never before, IE forces users to think their proposals through carefully and build sound justification cases. Typically, if a project scores low, its user sponsors will either scrap it or go back to the drawing board. "They rescope and redefine the project to bring it more in line with the business priorities, which is what we're trying to accomplish with this in the first place," Walker said.

A less pragmatic but farther reaching benefit of IE is its ability to foster teamwork and consensus-building among IS, users and top executives. Each is a vital cog in the IE justification machinery, and all should be represented on peer-review teams.

The user, as noted above, is in the best position to rate the systems against business objectives. In the past, many IS people have frowned on user sponsorship because of users' tendency to fudge predicted payoffs. "They knew that if they made it sound good enough, we'd build it for them," said one IS development manager. But the

MOST CIOs ADMITTED THEIR FIRMS fail to conduct formal systems-benefits audits and hold users accountable for realizing the benefits.

peer-review process built into IE exposes such exaggerations. "We have eight people on the peer-review panel who are pretty savvy about the airline industry, so somebody can't waltz in with some crazy number and put his project on top of everyone else's," said Fred Haecker, manager of strategic IS planning at USAir, headquartered in Arlington, Va.

Senior executives are the team members who should identify and weight the business objectives. "It wasn't easy, but we got corporate officers involved in establishing the [objectives] categories and assigning values for each," said Charles Grabner, na-

tional manager of technology services at Sears Canada. The Sears officers revise the weights each spring. "This year I think they will raise the weighting of ROI because we're in such [economic] difficulty," Grabner said.

Rounding out the IE team is information systems, which typically assesses the project's IT risk and its fit with IS's architectural direction. IS also helps determine costs and technical feasibility during the peer-review process. "IS has more of a consultative, facilitative role than in the past," Walker said.

Despite the team effort, one of IE's main drawbacks is that it can be a difficult concept to grasp and work with. Oracle Corp., of Redwood Shores, Calif., which markets its own version of IE under the name Cost Benefit-90, expended a lot of effort trying to simplify the methodology and shorten the learning curve for clients, according to Jack Keen, Oracle's national director of executive services.

Complexity also breeds cost. Cincinnati Bell waives the IE process for projects valued under \$10,000. Otherwise, "you could easily spend \$10,000 in time building a justification case for a \$10,000 project," said Tom Cunningham, the company's staff manager of systems planning.

The heavy-duty paperwork has its plus side, however. The rigorous process discourages users from proposing the kinds of dubious projects they came up with in the past, Renneker said. "We believe this has allowed us to cut back on our IS expenditures and focus our bucks on higher payoffs."

Perhaps IE's biggest weakness is its lack of a system to measure post-implementation benefits and their contribution to corporate success. Most CIOs admitted their firms fail to conduct formal systems-benefits audits and hold users accountable for realizing the benefits (see related story, Page 76). IE codeveloper Benson acknowledges the missing component and said it will be addressed in Information Economics Version II, due out in seminar form this summer and in book form later this year.

Another drawback is that, despite the hard numbers, IE is not an exact science. Consider the possibility that some very necessary upgrades to existing systems might rank unreasonably low because of inadver-

The Value of a Dollar

When software constitutes a company's fourth-largest cost, you'd better have a way to make sure the money's spent on the right projects—particularly when part of those costs come right out of your department's pocket

At Cincinnati Bell Telephone, a subsidiary of Cincinnati Bell Corp., user departments rely on Information Economics (IE) to prioritize their projects and quantify the business benefits. "Without this process, we tend to wander and spend money in the wrong places," said Chuck Schulze, vice president of consumer sales and services. "We need a rigid process to work out the priorities."

IE ranks proposed systems by their level of linkage with weighted business objectives. Besides prioritizing, the process also pinpoints the benefits the dollars are chasing. "It forces us to go through the benefits

analysis and make sure we don't spend money to tweak old systems that will soon be replaced with a new system," Schulze said.

As a business unit director, Schulze not only sponsors his own systems, he also judges others' proposals from his permanent seat on a seven-member peer-review council. "They have to get our buy-in," he said.

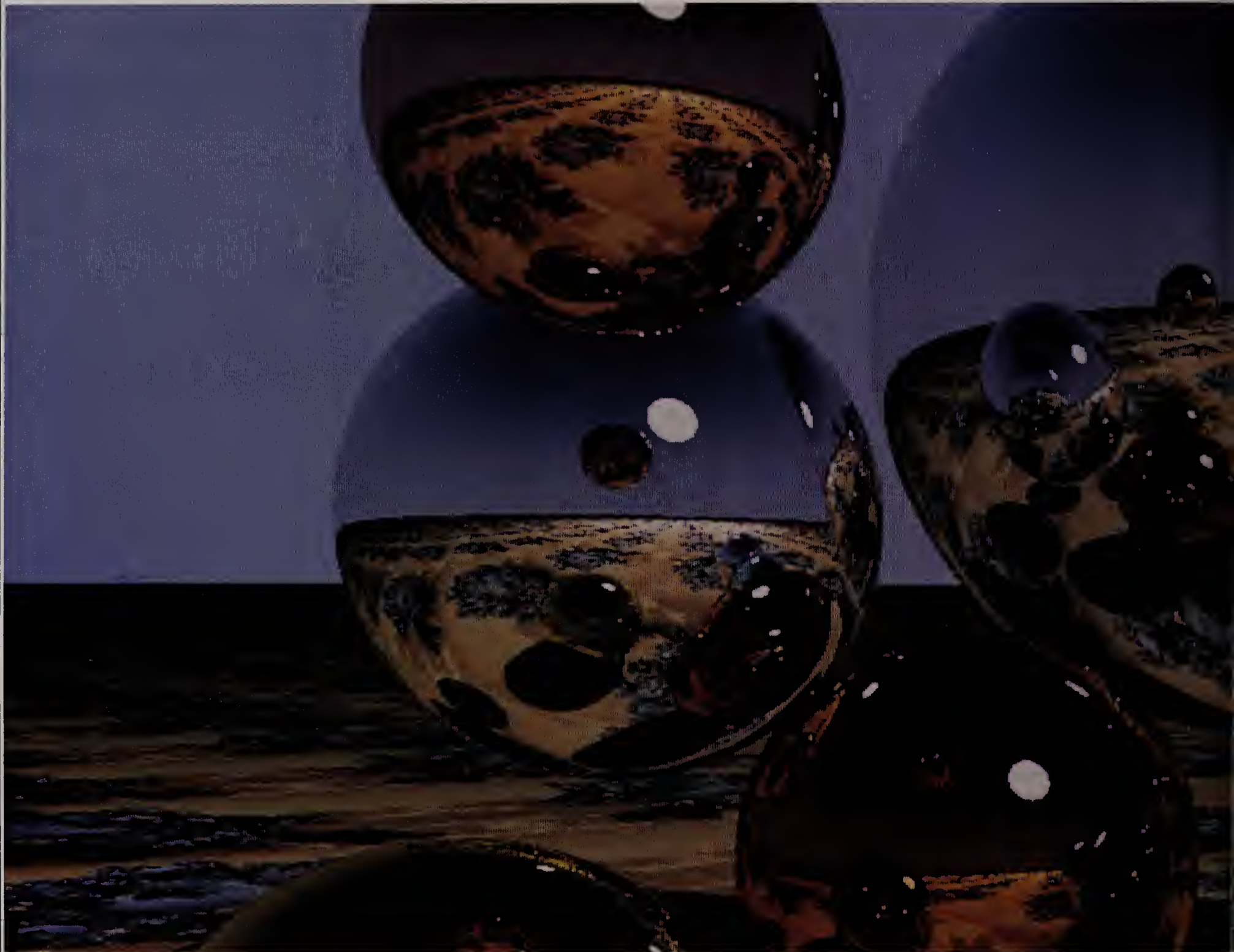
One might expect such a review board to be rife with both back-scratching and back-stabbing politics. Not so, Schulze said. "Most of these systems are multidepartmental in scope, so I'm looking at something that doesn't just serve me but maybe two other department heads. It's a supportive type of climate."

IE is paying off, reducing operational and maintenance costs and making those dollars available for development, according to Schulze. For this reason alone the method is a must at Cincinnati Bell, "because there's always greater requirements than what we can afford to fund."



CHUCK SCHULZE: AN END TO AIMLESS SPENDING

Bursting bubbles.



The computer that made

The bubble in the middle doesn't really exist. It's just an image made from reflections of the sky, of the ground, of the other bubbles.

Only they don't exist either. The whole picture is a mathematical fantasy, and the giant computers that put men on the moon would have struggled to create it.

But an IBM RISC System/6000[™], which can sit on your desk, did it easily using RISC technology which was invented by John Cocke, a research scientist at IBM. The RISC System/6000 isn't the only RISC computer, but it is the most advanced thanks to another idea (also Dr. Cocke's) called supersealar technology.

In an historic test at a national research lab, a



this picture is also making history.

RISC System/6000 was pitted against a Cray® supercomputer for selected applications, and it won. But even more startling, the same lab has since replaced one of its Crays with a network of our smaller machines.

We point this out, not to brag (well, maybe a little), but because the RISC System/6000 is fruit of IBM's huge investment in research, and it shows how our process is changing.

We spend over \$6 billion a year on R&D, and we probably do more pure research than anyone. But lately, our top scientists work more closely with real products, and it helps. For the RISC System/6000, the man who pioneered its basic technology also led it to

market. And the original lab team not only stayed with it, half of them moved from New York to Texas to join the development team.

As a result, our customers (often researchers themselves) can have massive computing power at affordable prices, to help them improve their own products.

But what hasn't changed about IBM research is the value of a person like John Cocke, who is one of 58 IBM Fellows. It's a title he earned by having great ideas, and it gives him the one thing he treasures most. Complete freedom to have more of them.

IBM®

JUSTIFYING TECHNOLOGY

HAPPILY, ONCE top executives buy into IE, they often see systems and the IS department in a better light.

tent bias in the scoring structure. "A project with a 100 score isn't necessarily twice as good as one with a 50," Renneker said. For example, the first application to work with newly installed IBM DB2 software may receive an undeservedly low score because of the negative "risk-factor" points associated with an unfamiliar (yet reliable) technology—in this case DB2.

Finally, while its benefits might outweigh its weaknesses, selling the IE concept to corporate top brass can give CIOs fits. Chief financial officers often give new justification systems the cold shoulder. "I think this will be more acceptable to them than the [former] intangible justification method, but it will still be a hard sell to someone who is very dollars-oriented," said Ray Bell, technical consultant for IS planning and economics at Amoco Corp. in Chicago. Amoco is piloting IE in its U.S. development and marketing units, and its Canadian subsidiary is using Oracle's CB-90 version, but as yet there is no corporatewide executive

support for the methodology, said Bell.

Happily, once top executives buy into IE, they often see systems and the IS department in a better light. "We find it increases senior management's confidence that IS is making the right decisions," said Oracle's Keen.

Further, it clarifies, perhaps for the first time in an organization's history, that IS is following a blueprint of business rather than technology objectives. "The IS guy will be seen as a servant to the business rather than to technology, which is exactly what we want to accomplish," said Benson.

IS managers are already perceiving a change. "We're not seen anymore as the back-room boys trying to dictate the business direction by the technology we choose to employ," Walker said. "We're using the business priorities to determine the work we take on, and we're seen as an integral factor in the business's success." Today, for any IS group, that is the ultimate justification. **CIO**

One Company's Scoring System

At Cincinnati Bell Telephone, projects receive positive and negative points based on their level of impact on the following goals and risk categories.

BUSINESS OBJECTIVE SCORES

1. Economic cost impact: Up to 25 points

2. Strategic business direction: 20 points

Projects receive a full 20 points if they impact any one objective in four strategic direction sub-categories:

1. Corporate goals (e.g., expanding beyond current market area)

2. Network goals (e.g., enhancing the network infrastructure)

3. Employee goals (e.g., reducing impact from employee retirements)

4. Customer goals (e.g., allowing customer to more easily do business with company 24 hours a day)

3. Competitive advantage: 0 to 15 points

4. Management decision support: 0 to 5 points

5. Other intangible benefits: 0 to 5 points

6. Support for new technology: 0 to 15 points

RISK SCORES

1. Competitive response: 0 to 15 points

Based on the competitive risks of not undertaking a project.

2. Project/organizational risk: 0 to -5 points

3. Definitional uncertainty: 0 to -10 points

Based on how well the sponsor has defined his or her project's objectives, scope and requirements.

4. Technical uncertainty: 0 to -5 points

Based on how much the project relies on IS's current versus new technical skills.

5. Infrastructure risk: 0 to -10 points

Based on degree to which projects are aligned with IS architecture trends.

YES! SEND ME INFO ON EIS II.

Send me a free Information Kit on EIS II — the new generation of Executive Information Systems from Information Resources.

Return this coupon today
or call us directly at
1-800-765-7227
(416-221-2100 in Canada).

Or FAX this card to
617-890-4660


SOFTWARE PRODUCTS GROUP

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Telephone _____

What is your involvement in selecting an
EIS for your organization?

- ☐ Evaluate/recommend
- ☐ Approve/authorize
- ☐ End-user

CIO



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 48046 WALTHAM, MA

POSTAGE WILL BE PAID BY ADDRESSEE

**information
resources**

SOFTWARE PRODUCTS GROUP

Marketing Department

Attn: D. Rooney

200 Fifth Avenue

Waltham, MA 02154



EIS II: THE FIRST ENTERPRISE-WIDE SOLUTION.

Open systems, client-server computing and workgroups. These are the new definitions for enterprise-wide corporate computing. And EIS II is the software solution:

■ **Integrated applications.** Departmental solutions for sales, marketing and finance support rapid prototyping, applications distribution and bottom-line results.

■ **Easy-to-use power.** EIS simplicity through an easy-to-use GUI coupled with true data-driven analytical power for executives, managers and analysts.

■ **One unified architecture.** Client-server versatility open to major hardware platforms and operating systems - on stand-alone PC, LAN, mini or mainframe.

■ **The bottom line.** Better information enterprise-wide, the tools to use it more profitably and lower support costs. That's why EIS II is the fastest-growing corporate computing solution.

Call **1-800-765-7227** for
a free EIS II Information Kit
(**416-221-2100** in Canada).



**information
resources**_{INC.}

SOFTWARE PRODUCTS GROUP

JUSTIFYING TECHNOLOGY

THE USERS' NEW CLOTHES

Gauging the business value of systems without input from users is like making a suit of clothes for someone who never shows up for a fitting. But establishing an IS-customer partnership may call for some alterations to the organization.

BY THOMAS KIELY

If, as many observers assert, IS must refashion its measurement portfolio to match the values of the business, then users must get involved. But teaming up with users can be difficult to manage, and establishing end-user measures can be a complicated task. Sometimes it requires organizational change.

Many organizations have already heard the call. At Westinghouse in Pittsburgh, for instance, a user group, a management advisory committee or even a senior line manager might champion a new technology initiative. In many instances the project will begin with a thorough scrutiny of the process that is to be automated, using a methodology developed at Westinghouse. The exercise helps managers to rethink the process and determine how it embodies the goals of the organization—but it also forces the customer to define the business values for the new system.

"Customer focus is absolutely critical," said David Edison, executive vice president of the Communications Systems division at

Westinghouse. "There has been a lot of disappointment in IT systems in the last few years, and that is [in part] the consequence of not getting the involvement of customers at the start, and having them help to define the value of systems."

Users are an integral part of the IS activities at First Chicago Corp., one of the nation's largest banks. Systems are initiated by business managers, or teams of managers, and defined and purchased by internal customers. Post-implementation, customers preside over weekly performance meetings to make sure that IS keeps those systems up to snuff. As a result, many primary IS measurements are salutes to the customer: how quickly business-critical systems can be delivered; mean time to restore an outage; even mean time to recognize an outage.

End users at St. Francis Hospital in Roslyn, N.Y., plunge into the business of buying new systems: drawing up a checklist of system needs, attending vendor demonstrations and helping IS staff weigh the final purchasing decisions. Users also eval-

uate the system after installation. And at PepsiCo, where a customer-focused cultural revolution is underway, IS staff team up with users to make sure new systems will meet the users' needs and deliver value to their customers.

The search for new measurements is changing the way some IS operations do business. Lehigh Press Inc., headquartered in Cherry Hill, N.J., is in the process of overhauling its entire architecture. Once a 1960s-style batch-processing shop, the company is barreling headlong into distributed systems (mixing IBM and DEC technologies) and redoing every single application. While the IS department will write the functions for each new application, the line customer initially details the business process that is to be automated. Then, with the IS blueprints in hand, the customer pitches to the executive committee a business case for funding the application. If the project is approved, then the customer foots the bill and does any post-implementation cost/benefit analysis.

Essentially, customers are increasingly calling the shots at Lehigh Press. The IS department is even trying to get its customers to use a data-flow methodology to define systems. "We're trying to get IS staff out of the mode of being report writers," said Phil Marzullo, Lehigh's director of information services. "We're becoming consultants."

But sometimes improved customer relations requires organizational change. Customers at a large utility company pitch in to define new systems (IS assesses the costs) and pay the bill out of their line budgets. But these customers are not held accountable for the systems they purchase, so they have little reason to accurately assess the value of the delivered system.

In fact, this arrangement encourages customers to fudge numbers. For instance, a user department may make the case that a new materials system will save it \$100,000. Since senior management does not hold the department to its promise—saved resources are generally reallocated elsewhere within the department—customers inflate promises of new systems to sell the need for them. Without hard measurements, the IS department can't demonstrate value. "All my benefits are invisible [to the company], so I've got to be able to set hard measurements," the utility's CIO said.



Because enlisting users in assessing the benefits of an installed system sometimes requires tough organizational—and budgetary—changes, it is done infrequently, many observers say. In some companies it simply hasn't become part of the process—yet. But without user participation, only half the value story gets told.

"We recognize it's something we should do to improve our development methodologies and estimating processes," said Fred W. Haecker, manager of strategic IS planning at USAir, headquartered in Arlington, Va. At Federal Express, based in Memphis, Tenn., "our [post-implementation] dialogue with end users is not as good now as it should be," said Dennis Jones, the new CIO and senior vice president of the ITD division. Over the next year, Jones wants to develop a survey that will help IS measure the benefits it provides to its users.

Xerox Corp. of Rochester, N.Y., is also grappling with the hows and whys of benefits analysis. At Xerox, customers help to assemble a cost-benefits study for systems under evaluation (a board composed of function managers prioritizes systems), but they don't hold a yardstick up to the delivered system to see how it measures up. IS wants to "close the loop," said Scott Hatfield,

"THERE HAS been a lot of disappointment in IT systems in the last few years, and that is in part the consequence of not getting the involvement of customers at the start."

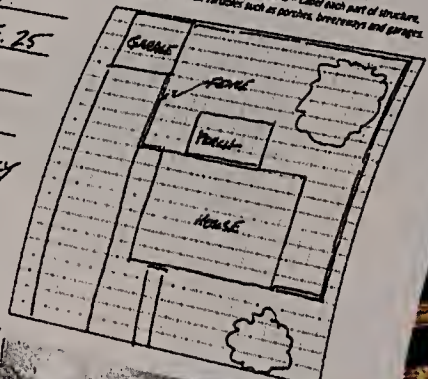
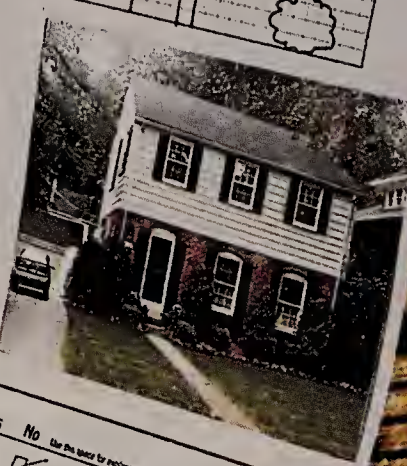
—David Edison

PHOTO BY RALPH MERCER

Property Inspection and Appraisal Form

Date 8/8/91
 Insured JOHN G. MILLER
 Property Location AVE. DEVERE 25
ST. PAUL
 Policy Number 4A61003
 Agency Name D.E. O'NEILL Agency
 Agency Code Number 2B9004C
 Prepared By M. A. PETERSON
 Signature M. A. Peterson

Draw Diagram of Ground Floor Area:
 Diagram Instruction: Show dimensions - Label each part of structure, especially valuation variables such as porches, breezeways and garages.

Describe Immediate Surroundings

☐ Industrial	☒ Subdivision
☐ Rural	☒ Residential
☐ Urban	☐ Isolated
☐ Deteriorating	☒ Stable
☐ Improving	

Inspection

Roof (if yes, explain) _____

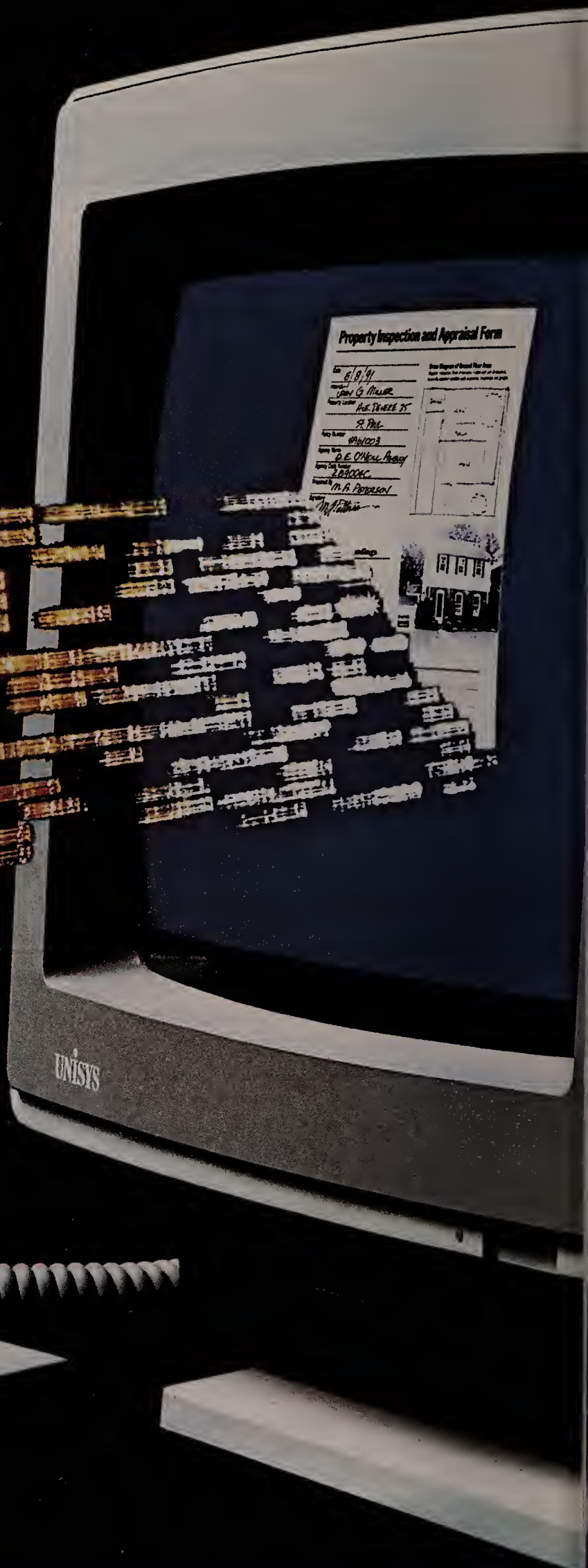
Foundation missing or in poor condition? Yes ☐ No ☒

Exterior of dwelling exposed to weather? Yes ☐ No ☒

Interior in poor condition? Yes ☐ No ☒

Operations? Yes ☐ No ☒

Other: Fenced, inground



If an image is worth a thousand words, imagine what imaging is worth to you.

Your strategic picture. Like the strategic pictures of businesses and governments around the world, it's what Unisys had in mind when we designed our InfoImage family of imaging solutions.

The benefits go beyond reductions in paperwork. Beyond protecting the integrity of originals. Even beyond savings from enhanced productivity. For InfoImage solutions not only help you process applications quicker, handle claims more efficiently, and respond to customers faster. They also help you create marketable, revenue-generating new services.

Whatever your business and whatever it's built on—checks or claims, correspondence or blueprints or signed authorizations—our imaging solutions enable you to capture documents electronically. You can move them throughout your enterprise, gain simultaneous access to them, and put them to work growing your business.

As a leader in imaging, we know that truly advanced solutions do not consist of technology for

UNISYS
We make it happen.

technology's sake. Beginning with a careful understanding of the customer's needs, we apply imaging technology to reflect the unique flow of information within an organization. And our InfoImage Professional Services recognize that an imaging solution isn't a solution unless it's integrated into the customer's existing systems.

Whether you're in finance, government, travel, telecommunications or any other service industry, call us at 1-800-448-1424, ext. 139. Ask how our imaging solutions can help improve your business picture today.

JUSTIFYING TECHNOLOGY

A Funny Thing Happened on the Way to Delivery...

The more things change, the less a project's initial evaluation stays the same. GTE's volatility metric measures the cost of deviation.

Metrics could provide a common language between IS and its customers—the concrete nouns and verbs that let each know where the other stands, and how much everything will cost. But how does one create a language of calipers and protractors?

GTE's Telephone Operations division in Temple Terrace, Fla., is taking one approach. Technology specialists within the compa-



ny's quality unit are trying to develop a volatility metric—a yardstick for measuring the cost of change during a development project. When the metric is polished and ready for use, said Jerry Crall, manager of software metrics, developers and customers alike will gain a tool to measure the consequences—to both the delivery schedule and the bud-

get—of any proposed changes to a project. The changes measured may be minor tweaks (such as a reconfigured help screen) or major alterations in the project's architecture.

The metrics group intends to use function points and "rework" measures (including a count of the number of change requests and their associated costs) as the core of the volatility metric. "It will be a measure of change in the requirements from the initial stages of the project to its final stages," said Crall. "We want to give the users the responsibility to make the decisions [about changes]."

Obviously, changes tend to be less costly earlier in the process; recoding rings up a heavier tab on the IS meter than most changes done in the design stage. GTE hopes that its volatility metric will allow the company to accurately track where changes occur during its projects, gain a better understanding of the repercussions of change, and ultimately shave project costs. Since the metric gauges a process, it is also a handy tool for managing continuous improvement—and is one of a group of measures that can assess the bottom line of quality efforts.

—T. Kiely

manager of knowledge-based systems, in part because an accurate measurement of a system's benefits will help to sharpen the accuracy of the predevelopment estimates for future systems, too.

Hatfield sees one glitch in post-development customer measures, though. Business isn't static, so expectations change in the time between the commitment to build the system and its delivery. The challenge is to find measures that take into account (and balance) mutable business expectations.

That is not a trivial challenge, as IS executives at companies that close the loop have discovered. At PPG Industries, a diversified manufacturing company in Pittsburgh, customers have representatives on both planning and post-implementation teams. Typically, the mop-up analysis occurs soon after the system is installed. "We ask the question: Are we seeing the benefits we expected?" said Larry York, formerly the manager of IS technical services (and now no longer with PPG). "But since the environment changes during the implementation, it is difficult to tell what savings are attributable to the project," as opposed to those gleaned from a host of other small and large changes, or from the typical reengineering of business processes that accompanies an implementation.

"There are no simple, clear-cut measurements for this," York added.

Then again, some IS managers can't count on the support of customers in a post-implementation analysis at all. Joe Torch, director of technical services at Crawford & Co., an insurance company in Atlanta, notes that "it is sometimes possible to get users to help assess the benefits of a new system, but usually not. They're reluctant to give the time commitment. The feeling is that the benefits are obvious."

Jack Cooper, CIO and vice president of Joseph E. Seagram & Sons Inc. in New York believes that IS must rally around the customer in the next few years. All organizations are finding that they need to get closer to their customers—after all, it is the customer who defines value. Why should IS be immune to this drift? "We didn't do a very good job of this in the 1980s," Cooper said. "We have to do a better job in the 1990s. With the growth of IS budgets, and the plight that companies are in, IS has to begin to protect itself. This is a must for survival." **CIO**

Make The Most Of Your Editorial Coverage With Reprints From CIO



Reprinted through the
courtesy of CIO Magazine
© 1989 CIO Publishing Inc.

Coverage in CIO of your company's products, services or innovative activities means valuable exposure in a broad spectrum of markets. Build on the positive impact by ordering your reprints today.

Editorial reprints make great leave-behinds for:

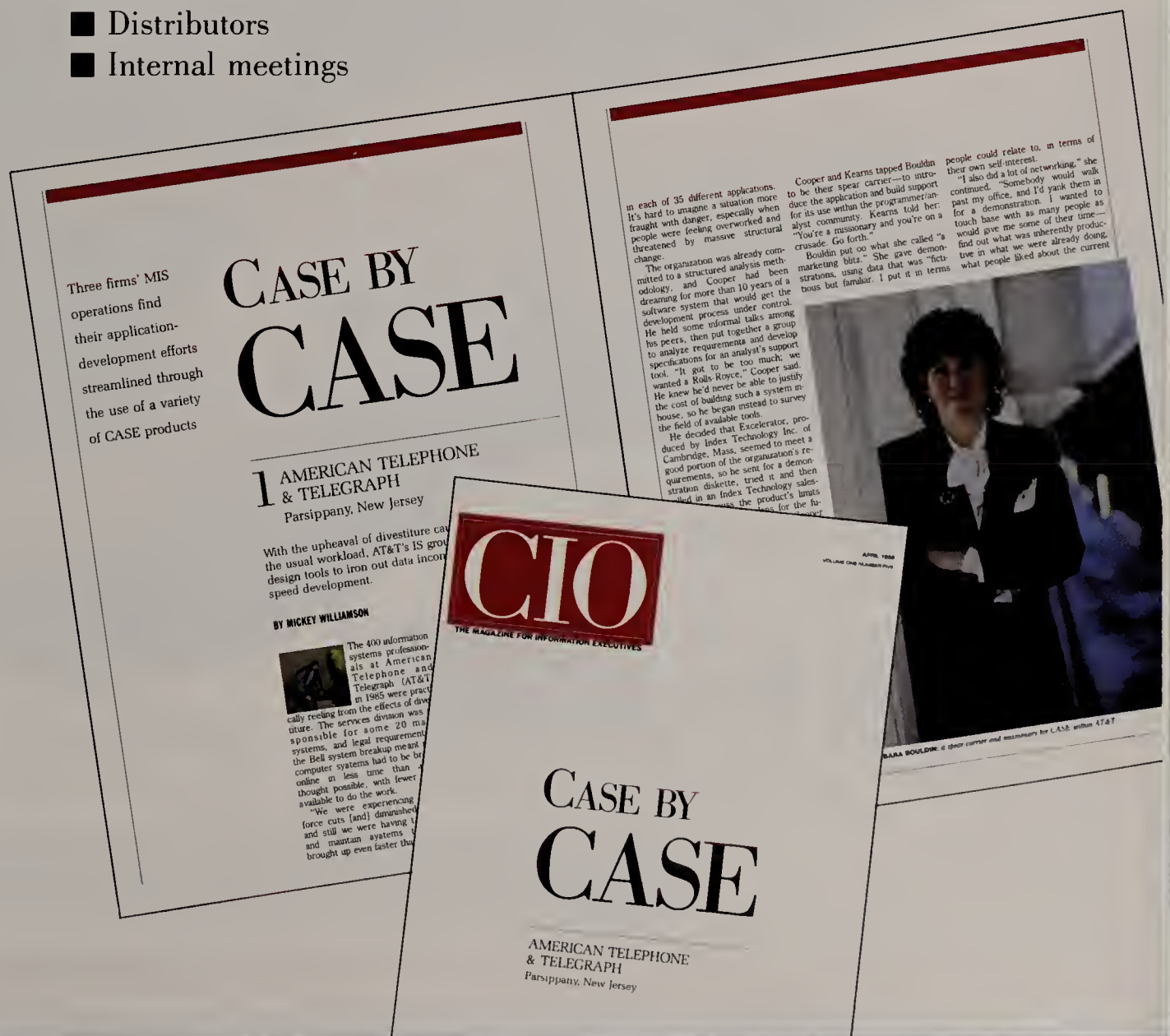
- Press
- Sales prospects
- Company seminars
- Trade shows
- Distributors
- Internal meetings

Reprints can be customized to include your advertisement, company logo, address and sales office listing.

For more information, call:

Walter Manninen
508-935-4101

CIO Publishing
492 Old Connecticut Path
P.O. Box 9208
Framingham, MA 01701



Now there's a comp as fertile as the mi

Lotus® Notes® is more than a technology story. It's a breakthrough solution that solves real business problems by helping you harvest the collective expertise within your organization. Not to mention making better use of your existing hardware, software and network investments.

Look at the challenges on the business horizon.

that helps you accomplish all this with relative ease.

What's more, if you're an IT or MIS professional, you're concerned with finding a better way to leverage the technological resources already in place within your organization. Without incurring major expenditures of time and money.

With Notes, you can deliver customized and flexible applications to workgroups in less time.

There's the perennial need to be more competitive. To grow the business. To get closer to your customers and suppliers. There's also the need to do more with less. And to enhance the quality of the products or services you deliver to your customers. Notes is the tool

And for less money. That's because Notes gives you an open, application development environment to work in. Where the widest variety of

Lotus Notes is an innovative, workgroup computing environment

Computing environment ends that work in it.

applications that facilitate information sharing can be quickly developed and deployed to multiple users at multiple sites. Regardless of what networks, applications and operating systems are in place.

With Notes, both IT professionals and end users can work together to create applications that solve very specific problems.

In fact, right now there are small and large companies using Notes for sales lead tracking, product planning, brainstorming, account management, project tracking,



Lotus Notes lets you bring different areas of expertise together within your organization more naturally.

All of which makes Lotus Notes much more than a single application. It's an environment that's extremely flexible. Plus, it runs on the most popular networks such as Novell®, IBM®, Microsoft® DEC® and Banyan®. And in Windows® and OS/2®.

Of course, just as we've done with 1-2-3®, we're committed to having Notes run on all major platforms, including

Macintosh® and UNIX®. Plus there are many third parties offering a range of products and services that further extend the value of Notes.

What's more, when you look at all Notes can do—and how quickly it can do it—it's not very expensive at all. In fact, you can get started with Notes for about \$500 per user.

So call us today at **1-800-872-3387, ext. 6695**. And see how Lotus Notes is cultivating a better environment in which people can truly work together.

"With Notes we now have a quicker, more efficient way of delivering some incredibly useful applications to our people. For example, we created a customer information and profile application that was up and running in less than two months. Now that's fast.

Further down the road, we're envisioning a model that serves as a virtual town meeting for everyone in the organization. Where no matter what any one of us is trying to accomplish at any point in time, we'll have all the resources of the rest of the organization behind us and available to us. Which means as IT professionals, we will be in a much better position to help our company realize its business goals. And to bring a better level of service to our customers."

*Bob Kantor
Ciba-Geigy Corporation*

call reporting, quality management and a whole lot more.

Lotus Notes

Environment designed to increase your organization's productivity.

JUSTIFYING TECHNOLOGY

NOT MEASURING UP

Our survey of CIOs shows epidemic levels of displeasure with their organizations' justification programs

BY DUDLEY P. COOKE AND EDWARD B. PARRISH

When it comes to evaluating, monitoring and managing systems investments, CIOs are feeling widespread dissatisfaction with the process, according to a recent survey conducted by *CIO* magazine and the Executive Insight Group Inc., a consulting firm based in Bryn Mawr, Pa.

In the poll of more than 160 IS executives, an eye-opening two-thirds expressed dismay over their companies' justification procedures—and, sometimes, lack of same. The main problems identified in the study boil down to a failure to put in place justification programs—and key support mechanisms such as chargeback—that spur greater user involvement in, and ownership of, IT systems; and the lack of adequate post-implementation accountability for achieved system benefits.

It's one thing to gripe about the processes of evaluating systems investments. It's another to take positive action. The survey suggests that CIOs are not pushing hard enough for remedies. Once senior management or steering committees endorse systems expenditures, CIOs tend to walk away from the process, perhaps believing that such endorsements relieve them of further accountability. If so, CIOs are squan-

dering an opportunity to seize the initiative and shore up the processes' weak points. The consequences of inaction will become painfully clear when corporate officers eventually ask for evidence of the value added by information systems. The answer would be more easily supplied, at least for individual systems investments, if only CIOs were proactive about quantifying and monitoring systems benefits.

One way CIOs can improve these processes is to bring users into the act and hold them responsible for system costs. Few do, however. Some 60 percent of respondent companies do not transfer systems-development and -support costs back to users. This can lead to users regarding IT as a "free good"; and things that are free tend not to be valued. If CIOs take the lead in promoting a rational chargeback policy, users will be more motivated to look at systems with an eye toward value-driven business decisions.

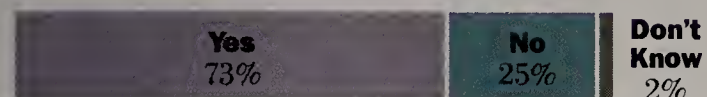
Not only is chargeback missing at many companies; 71 percent of respondents said that at least some user-department IS costs are contained in the budget of the central IS function. This further weakens users' incentive to focus on the business value of systems since they don't control the budget and may never even see the costs.

Another way CIOs can enhance the process is by insisting on post-implementation audits to account for and monitor achieved system benefits. While 60 percent of sur-

CIO Survey: Cause for Complaint

1. Are the benefits of investments quantified and verifiable...

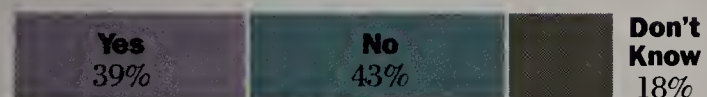
...In applications?



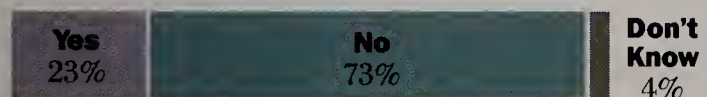
...In end-user computing?



...In the infrastructure?



2. Are users held responsible for measuring the achievement of the benefits of IS investments?



3. Are any user-department IS costs contained in the budget of the IS central function?



4. Are systems costs transferred to users on a regular monthly basis for...

...applications development?



...applications support/maintenance?



...data processing and telecommunications?



5. Does senior management or a steering committee oversee benefits, priorities and the overall cost of IS investments?



6. Are you satisfied with the way in which systems investments are evaluated, monitored and managed in your company?



SOURCE: CIO AND THE EXECUTIVE INSIGHT GROUP

vey respondents said that they track achieved benefits, only 36 percent of that group expressed satisfaction with the procedure. Perhaps that's because not enough firms hold users—the group closest to the benefits—responsible for monitoring them. Only 40 percent of those firms that audit benefits hold users responsible. Not coincidentally, CIOs at the minority of firms that put users on the spot expressed greater satisfaction with the overall process.

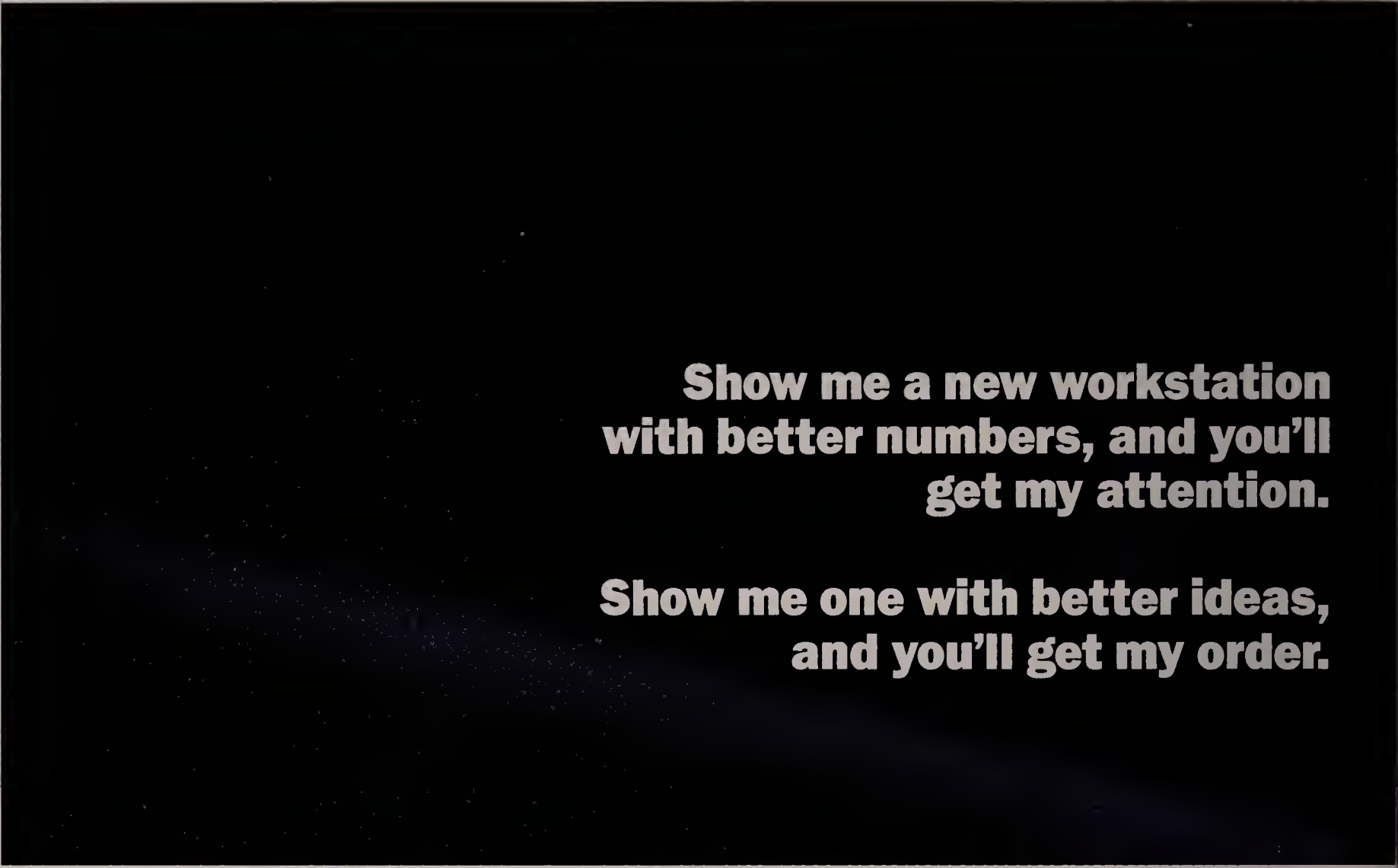
Unfortunately, many companies have a long way to go before they can even try these improvement strategies. Some have not even reached the point of consistently quantifying expected system benefits. While 72 percent of respondents quantify anticipated benefits of applications projects, on-

ly 48 percent do so for end-user computing systems. An even smaller number, 38 percent, put a value on the benefits of IT infrastructure investments—most of these projects are apparently winning approval on the basis of someone's hunch about their potential payoff.

Rapidly growing executive agnosticism toward IS value is certainly enough to petrify any CIO. But the aggressive IS leader should see in this adverse environment an opportunity to command new credibility in evaluating and realizing the value of systems investments. **CIO**

Dudley P. Cooke and Edward B. Parrish are president and vice president of the Executive Insight Group Inc. in Bryn Mawr, Pa.

ONE WAY CIOs can improve these processes is to bring users into the act and hold them responsible for system costs. Few do.



**Show me a new workstation
with better numbers, and you'll
get my attention.**

**Show me one with better ideas,
and you'll get my order.**

Introducing SPARCstation 10.



The new Sun™ SPARCstation™ 10 system is four times more powerful than any workstation we've ever made.

But that alone is no reason to buy it.

The fact that it runs your applications faster, makes your investment go farther, and embraces innovation sooner — those are even more important reasons.

The SPARCstation 10, you see, is not just a new model number. It's an entirely new workstation, reengineered from the footpads up. With a faster processor, a faster system bus, faster input/output, faster networking, and built-in multiprocessing.

Yet it's fully compatible with all previous SPARCstation systems. And because it runs the Solaris® operating environment, you can use thousands of existing applications.

The net result is a dramatic improvement in how quickly those applications run — and

a real difference in when your people's work gets done.

That's what gives the SPARCstation 10 its better numbers. Here's what makes it a better idea:

First, we put the processor on a small plug-in card, so you can easily upgrade from one generation of technology to the next for years to come.

Then we equipped the SPARCstation 10 for all kinds of imaginative new applications. Ones that take advantage of its built-in multiprocessing, CD-quality audio, and telephone/computer integration.

We'd love to show you more. Just call 1-800-426-5321, ext. 485 for complete information on the new SPARCstation 10, or the name of your Sun reseller or sales representative.

It's the first workstation to combine such powerful numbers with such potent ideas.

 **Sun Microsystems**
Computer Corporation

A Sun Microsystems, Inc. Business

Six Months of CIO

An index of all major articles published in *CIO* from January through June 1992, including a cross-reference by article type

Articles are numbered in sequence from the first issue of *CIO*. (See past Decembers' issues for guides to stories published prior to January 1992.) To help readers find articles of interest, we've added a cross-reference of categories at the end of the listing. For example, readers interested in industry overviews would look up article number 487.

JANUARY 1992

432. "The Call for Leadership" (Page 22)—how CIOs can play a leadership role in helping their companies prosper. By David Freedman

433. "Globe Trotters" (Page 42)—the payoff of setting up transnational networks. By Meghan O'Leary

434. "Surveying the Field" (Page 50)—getting up close and personal when it comes to appraising performance. By Richard Pastore

435. "Making the Grade" (Page 56)—the benefits of sponsoring university IS research flow both ways. By Arielle Emmett

436. "Mission: Critical" (Page 18)—an Outlook column on CIOs and the recession. By James A. Champy

437. "Going Beyond AI" (Page 62)—a State of the Art column on artificial neural networks. By Mickey Williamson

438. "Value-Added E-Mail" (Page 68)—a Working Smart column on Hughes' E-mail system. By Megan Santosus

FEBRUARY 1992

439. "Looking for Networking's Mr. Big" (Page 28)—Is there such a position as the Chief Networking Officer? By Thomas Kiely

440. "Working to Scale" (Page 36)—the problems faced by CIOs at small companies. By Kathleen Melymuka

441. "The High Price of Nice" (Page 56)—Sears takes a harder line to get trading partners to jump on its EDI bandwagon. By Richard Pastore

442. "Cyberspace Cadets" (Page 66)—What is the true nature of a hacker: budding criminal or computer genius? By Thomas Kiely

443. "Ordering Out for IS" (Page 18)—an Outlook column on the intriguing benefits of outsourcing. By Julie Schwartz

444. "Support Groups" (Page 25)—an Insights column on third-party software escrow arrangements. By Adele Kalas



445. "Team Tactics" (Page 74)—a Human Factors column on self-managing teams. By Harvey Shrednick, Richard Shutt and Madeline Weiss

446. "Helping Users Program" (Page 80)—a State of the Art column on end-user programming tools. By Lucie Juneau

447. "SuperSONIC" (Page 88)—a Working Smart column on MetLife's distributed sales network. By Megan Santosus

MARCH 1992 Special Software Issue

448. "Progress in the Pipeline" (Page 38)—Amoco's measured approach toward distributed processing. By David Freedman

449. "How to Be Wary Without Waffling" (Page 46)—CIOs need to move forward without moving too far or too fast in the wrong direction. By Meghan O'Leary

450. "A Promising Harvest" (Page 56)—vendors cultivate a burgeoning crop of distributed-computing tools. By Richard Pastore

451. "Systems on a Shoestring" (Page 66)—devising schemes for getting more mileage out of limited software budgets. By Thomas Kiely

452. "The Human Factor" (Page 74)—building a top-notch staff in the era of distributed computing. By Kathleen Melymuka

453. "The Fork in the PC Road" (Page 32)—an Insights column on the choice between Microsoft Windows and IBM's OS/2. By David Passmore

454. "Inner Resources" (Page 82)—a Human Factors column on effective technology trainers. By Ruth Colvin Clark

455. "Getting IT Together" (Page 86)—a State of the Art column on interoperability. By Melvyn E. Bergstein, Roderick S. Walker and Timothy McBrean

456. "Computer-Aided Crime Prevention" (Page 96)—a Working Smart column on the Minneapolis Police Department's 911 system. By Megan Santosus

APRIL 1, 1992

457. "Team Boosters" (Page 36)—how CIOs can support manufacturing enterprises. By Allan E. Alter

458. "The Image Makeover" (Page 44)—how imaging causes workplace transformation. By Richard Pastore

459. "New Bonds on Wall Street" (Page 52)—six Wall Street firms collaborate with information technology. By David Freedman

460. "Sympathy for the Consultant" (Page 27)—a First Person

column on the new, reengineered Tripp Strange. By Tripp Strange

461. "The Virtuous Virus" (Page 30)—an Insights column on the beneficial use of viruses. By Fred Cohen

462. "Simplify, Simplify" (Page 58)—a State of the Art column on RISC technology. By David Freedman

463. "Taking Care of Patient Data" (Page 64)—a Working Smart column on Lutheran Hospital's bedside computers. By Megan Santosus

APRIL 15, 1992 Strategic Outlook on Downsizing

464. "Intimate Technology, and All That Jazz" (Page 28)—a profile of PC visionary Alan Kay. By Meghan O'Leary

465. "Keeping Up with the Ins and Outs" (Page 33)—downsizing's mixed bag of payoffs, tradeoffs and unanswered questions. By Thomas Kiely

466. "Hearts and Minds" (Page 44)—dealing with the culture shock of downsizing. By Meghan O'Leary

467. "Nuts and Bolts" (Page 48)—managing the thorny technical issues that bedevil downsizing organizations. By Thomas Kiely



468. "Means to an End" (Page 54)—Brush Wellman's downsizing and reengineering project. By Meghan O'Leary

469. "Profiles in Management" (Page 24)—an Insights column on a recent SIM survey. By Edward R. Mills

470. "The Shadow Analysts" (Page 58)—a Human Factors column on independent systems specialists. By David J. Marley and Don W. Meyers

471. "Listening In" (Page 62)—a State of the Art column on voice-recognition technologies. By Elaine Cascio

MAY 1, 1992

472. "The Perils of Power" (Page 24)—how managers can effectively enact worker empowerment. By Thomas Kiely

473. "Integration for Sale" (Page 34)—managing the relationship with a systems integrator. By Meghan O'Leary

474. "The Mad Doctor of Corporate Travel" (Page 44)—a profile of Rosenbluth Travel. By Richard Pastore



475. "Here, There and Everywhere" (Page 52)—the art of logistics, and how it applies to the entire distribution pipeline. By Lucie Juneau

476. "Combating Complexity" (Page 20)—an Insights column on business reengineering. By Robert M. Rubin

477. "Well Connected" (Page 58)—a State of the Art column on middleware. By Barbara E. Sanerud

478. "Held Over by Popular Demand" (Page 64)—a Working Smart column on D&B Software's videoconferencing system. By Megan Santosus

MAY 15, 1992

Strategic Outlook on Supernetworking

479. "Changing the Rules" (Page 30)—coming up with new metrics to gauge business success. By Scott Wallace

480. "The Big Band Era" (Page 37)—preparing for the impending explosion of high-bandwidth applications. By David Freedman

481. "The Band Plays On" (Page 48)—CIOs who don't adopt supernetworking may find their networks out of tune. By Allan E. Alter

482. "Health Care's Band Leader" (Page 50)—Minnesota's largest health-care provider's trial of high-speed, high-bandwidth networking. By Allan E. Alter

483. "The Dean's List" (Page 54)—an interview with Wharton Dean Tom Gerrity. By Allan E. Alter

484. "Do the Right Thing" (Page 26)—an Insights column on ethics in the computer profession. By Don Gotterbarn

485. "Frontline" (Page 62)—looking forward to the day when computers are as ubiquitous as toasters. By Portia Isaacson

486. "The Objective Approach" (Page 70)—a State of the Art column on object-oriented technology. By David Freedman

JUNE 1, 1992

487. "Birth of a Salesman" (Page 30)—once-complacent CIOs are learning to sell their services internally. By Meghan O'Leary

488. "The Education of a Line Manager" (Page 38)—a profile of Whirlpool Corp.'s Walt Coleman. By Lucie Juneau

489. "Gearing Up" (Page 48)—Detroit's Big Three are investing heavily in IT-supported process changes. By David Freedman

490. "Open-Ended Efforts" (Page 55)—various open-systems organizations are moving the standards-setting process along. By Megan Santosus



491. "Keeping the Faith" (Page 26)—an Insights column on the reemergence of CIM. By Joel A. Schnur

492. "Make Room for DASD" (Page 62)—a State of the Art column on data storage. By Kathleen Melymuka

493. "Waste Not, Want Not" (Page 72)—a Working Smart column on HFSI's systems reengineering project. By Megan Santosus

JUNE 15, 1992

Strategic Outlook on Measurement

494. "Big WAN on Campus" (Page 38)—Drew University's pervasive use of computers and communications technology. By Megan Santosus

495. "The Measure Hunt" (Page 59)—CIOs need concrete measures to estimate the value of technology. By Thomas Kiely

496. "Many Happy Returns" (Page 66)—Information Economics rates projects in relation to their contribution to stated business objectives. By Richard Pastore

497. "The Users' New Clothes" (Page 76)—IS must enlist end-user help in measuring the business benefits of IT. By Thomas Kiely

498. "Not Measuring Up" (Page 84)—survey results from CIO and the Executive Insight Group. By Dudley P. Cooke and Edward B. Parrish

499. "Getting the Message" (Page 32)—an Insights column on marketplace dynamics, organizational structures, and the flow of information. By Daniel S. Appleton

500. "Student Teachers" (Page 92)—a Human Factors column on the Odyssey of the Mind program. By Thomas M. Mauro

501. "Virtual Capitalists" (Page 94)—a State of the Art column on virtual reality. By Alice LaPlante

CROSS-REFERENCE OF ARTICLES BY TYPE

Technology Overviews generally deal with current developments concerning individual technologies or groups of technologies: 437, 446, 448, 450, 455, 457, 458, 461, 462, 471, 475, 477, 480, 485, 486, 492, 501

The CIO Role runs the gamut from what parts CIOs play in specific undertakings to the politics of corporate maneuvering: 432, 436, 439, 440, 460, 488, 499

Management/Personnel Issues include change management, management styles and professional development: 436, 439, 442, 445, 451, 452, 454, 457, 466, 470, 472, 484, 490, 500

Organizational Issues range from the role of IT in the organization to the structures and processes of the organization as a whole: 432, 434, 435, 439, 440, 458, 464, 465, 469, 472, 476, 479, 495, 496, 497, 498, 499

Profiles of Organizations offer in-depth looks at companies', governments' and other organizations' use of IT: 459, 468, 474, 482, 483, 489, 494

Industry Overviews look at the use of IT within specific industries: 487

IT Strategies cover the use of IT in pursuit of specific business goals: 433, 441, 443, 448, 449, 451, 453, 459, 465, 466, 467, 468, 473, 474, 479, 480, 485, 488, 494, 495, 496, 497, 498

IT Implementation and Management covers a wide variety of issues associated with bringing systems and applications into being and managing their use: 433, 438, 441, 444, 446, 447, 448, 449, 451, 456, 457, 463, 465, 467, 473, 478, 480, 481, 482, 490, 491, 493

Readers interested in purchasing back issues should call Subscriber Services at 800 788-4605.

Student Teachers

The Odyssey of the Mind program, which fosters creativity in children, has shown one information executive that you can learn a lot from your kids—including how to enhance an IS team's performance

BY THOMAS M. MAURO



OM teams present their projects in competition.

Teamwork is an old management concept that has suddenly become popular among IS managers, like a catchy tune that becomes a hit years after it was first crooned over the airwaves. But for teams to work effectively, they must be carefully nurtured and deftly managed. The discriminating IS executive will want to keep up with new strategies in team dynamics. What techniques enhance a team's performance? How do teams discover methods for improving their efficiency? In part, managers learn the answers to such questions by studying the experiences of successful teams. During the last eight years, my school for team-building has been the Odyssey of the Mind program.

Odyssey of the Mind is an international school-based program aimed at fostering creativity in children. Launched more than a decade ago by a group of progressive educators in New Jersey led by Sam Micklus, a professor of engineering at Glassboro State College before his retirement, the program has mushroomed in recent years. Today hundreds of thousands of children in elementary, middle and high schools throughout the United States, Canada, Europe, China and Japan participate in Odyssey of the Mind.

Children in the program form small teams that work throughout the academic year on problems posed by the organization. Projects might require them to devise and build balsa-wood structures that can support hundreds of pounds of weight, construct vehicles that can help the team carry out certain predefined tasks,

or fashion short plays that imaginatively transcend some challenging limitations. The children present their solutions in annual competitions, during which they must also solve a short "spontaneous" problem popped by the judges—something like a surprise creativity quiz.

OM teaches teamwork, rewards risk and initiative, and encourages children to search for new, alternative—creative—solutions to problems. It also teaches a number of important lessons that echo workplace skills. For instance, children must define their final goals (their strategic plan), map out the steps required to get there (business plan), work within a budget and market their solutions to the end customer—the competition judges. Working as a team, they develop management and leadership talents, and they learn that everyone who participates in the group effort can make a contribution.

My children, my wife and I are all active participants in Odyssey of the Mind. My daughters are on teams, and my wife and I are coaches—that is to say, we are managers who have delegated accountability to the kids. OM coaches are facilitators, not top-down administrators; all decisions must be made by the team, free of adult meddling. (That is a pretty good job description for the manager of an empowered staff, too.)

A year before I first encountered Odyssey of the Mind, my organization—Norwest Technical Services Colorado (NTSC), a banking company in Denver—began using a team approach to develop information systems. In the last eight years, I have learned a great deal about teamwork, both from my IS employees and from my Odyssey of the Mind kids. Today it is hard for me to tell where my job as an IS

manager ends and my role as an OM coach begins, because I use the same skills when wearing either hat.

Empowerment and groupwork first arrived at NTSC in the early 1980s, when we became converts to structured programming and project-team management. Before the transition, programmers typically would go off to their cubicles and develop systems alone. With our current project methodology, we break systems into pieces and divide the work among staff teams. We tweaked the methodology throughout the 1980s, so that today most of our projects are done across departmental lines and involve the customer in the prototyping of systems. Teams manage the process.

We try to limit our teams to five to seven members—the required size for problem-solving groups in Odyssey of the Mind. (Smaller groups lack the mental diversity needed to generate creative ideas; larger groups suffer from too much diversity—and an abundance of chaos.)

In Odyssey of the Mind, children approach each problem or component of a problem by first brainstorming ideas, then critiquing, sorting and prioritizing them. At NTSC, IS teams also begin by brainstorming. For instance, a recent project involved the development of an electronic bank window. This system allows corporate commercial customers to enter our computers and take a look at their accounts, their relationships with us and their cash-management positions. The team began by brainstorming the kinds of data customers might want, the kinds of data we could provide and presumptions about how customers might use the data. These same approaches are now being incorporated into the methodologies and processes of the organization's CASE efforts.

We learned the second step from Odyssey of the Mind, too. On successful OM teams, children don't criticize each other's ideas; they critique them. No idea is "wrong," no matter how off-the-wall. In fact, the children must offer a viable alternative before discarding any standing idea. In this way, they learn to

evaluate tradeoffs and set priorities. It is a crucial step in the creative process, and criticism plays the spoiler. Chiding words or sour looks tend to discourage individuals from airing their ideas, so that they voice instead only the safer thoughts, the shopworn notions.

At NTSC we apply the OM critiquing process during prototyping. When we began to prototype ideas for our electronic bank window, for example, we asked our customers for their comments and then used

Perhaps the most important skill fostered by OM is divergent thinking.

these to critique our concepts. Team members did not criticize each other (or themselves) when ideas did not exactly meet customers' needs. Rather, they used this new information to help shape the evolving system. Following the critique session the team brainstormed once again, generating new ideas to replace unsatisfactory functions. We repeated this process—that is, we continuously reimagined the project—until we were right on the mark.

This approach creates an atmosphere of acceptance and encourages participation among project staff. Every member of the team is an important contributor—another important lesson of Odyssey of the Mind. At NTSC we've found that the supportive group environment helps average performers blossom into above-average team contributors. People who normally sit back and watch are challenged to participate; these are sometimes the people who have the best ideas but lack the opportunity—or the gumption—to express them. It goes to the heart of empowerment.

Perhaps the most important skill fostered by OM is divergent think-

ing. Children participating in the program become adept at looking for new ways to solve old problems. They become mental risk-takers because the whole program promotes risk-taking, nurtures and rewards it.

Unfortunately, corporate structures are not the ideal nurseries for divergent thinking. Habits of mind, corporate culture and financial or organizational constraints conspire against freewheeling new ideas. (Of course, the traditional, sequential systems-development methodology does not necessarily encourage divergent thinking either.) However, here at Norwest, we include such OM techniques as brainstorming and critiquing in our training sessions, and we encourage team members to use these techniques as part of the systems-development process. We would like our people to look at each new project fresh, not simply follow tried-and-true paths.

Just as OM has helped to enrich the teamwork process at Norwest, Norwest has returned the favor to my kids. When our IS teams meet, they use flip charts or Post-it notes to document all ideas. They then use these charts to help sketch out requirements documents for a new system. When I attend Odyssey of the Mind meetings, I take these same tools with me. A facilitator will write down every idea expressed by the team. Before the solution is finalized, a place is found for every idea. Every long-term project has its own systems requirements.

Training new minds in these principles will provide America with a highly creative pool of entrepreneurs who know how to get things done. Investing a few dollars in these same techniques in your IS department will improve your productivity and spark innovative approaches to IS development. ☐

Thomas Mauro is vice president of applications development at Norwest Technical Services Colorado in Denver. For more information about Odyssey of the Mind, write to OM Association Inc., P.O. Box 27, Glassboro, N.J. 08028.

Acha The E

Better Service, Better Support, In Response To Rapidly Changing

WHEN CLIENTS SPEAK, WE LISTEN.

And lately we've been hearing a lot.

About tight, tight budgets and the critical need for investment protection. About new plans for client-server technology and distributed processing. About emerging platforms, portability and enterprise-wide integration.

And even about your many frustrations with some of the things most software companies do. Or don't do.

FROM TOP TO BOTTOM, OUR ENTIRE CLIENT SERVICE ORGANIZATION HAS BEEN RESTRUCTURED.

And you know something? We agree. With just about everything you said. Good and bad. The best part is, we're doing something about it.

CA90s



CA's Computing
Architecture For
The 90s.

We're replacing our Account Managers with a dedicated CA Service Team comprised of a Client Service Representative and a Technical Service Representative which will act as a single point of contact for each client. The Team will have no direct sales role, so they can focus solely on giving you better client service and technical support.

WE'VE ELIMINATED MANY RESTRICTIONS AND HIGHLY-COMPLICATED PRICING ARRANGEMENTS.

The Client Service Representative will manage the relationship and make sure that all of your needs are met. The Technical Service Representative will act as a "techie on-site" and identify and solve any and all technical problems.

For specific product expertise and support, we've assigned hundreds of marketing specialists, product consultants and systems engineers to product specialty groups,

Change For Better.

Better Prices, Better Quality.
Client Needs, We're Changing, Too.

including Systems, Information Management, Application Development, Business Applications, Mid-Range and Micro software. We're also doubling the number of our Client Base Administrators, quadrupling the staff in our National Accounts area, and upgrading training and continuing education within the company and across the board.

**NEW SPECIAL NON-TIERED PRICING,
MAINTENANCE FREEZES, UPGRADE
SAVINGS, RIGHT-SIZING CREDITS AND
ENTERPRISE LICENSE PLANS.**

We took virtually all of your suggestions regarding pricing and maintenance and put them into practice. We're introducing a range of simpler, fairer, more affordable programs that give you the freedom to choose what's right for you. One plan can reduce your maintenance by as much as 40% per year.

With CA90s, Computing Architecture for the 90s, we

can keep pace with your needs because it helps us develop software in a fraction of the time it used to take. That's why we're leading the way into all of the emerging new platforms, including UNIX, AS/400, VSE/ESA, Windows and OS/2, with the broadest range of proven, portable software solutions in the world. From mainframe to mid-range to micro computers — did you know that we have more Windows products than Microsoft? — we have all the software you need. And we develop, license, service and support it just the way you want.

**FOR MORE INFORMATION,
DIAL 1-800-CALL CAI.**

Call today and we'll fill you in on all the changes. And keep telling us what you want.

As you can see, we're open to suggestions.

**COMPUTER[®]
ASSOCIATES**
Software superior by design.

© Computer Associates International, Inc., One Computer Associates Plaza, Islandia, NY 11788-7000.
All product names referenced herein are trademarks of their respective companies.

Virtual Capitalists

Despite its blue-sky reputation, down-to-earth companies are putting real money into virtual reality. Look for some promising, and potentially profitable, commercial applications to take root.

BY ALICE LAPLANTE

Virtual reality: How seriously should a CIO take it? Very, if the actions of such organizations as Boeing, IBM, Sun Microsystems, US WEST and Fujitsu are any clue.

These companies and others are investing heavily in virtual reality (VR) research in the hopes of a commercial payback some years down the road. And although serious VR researchers and developers bemoan the overly fantastical hype of science fiction paperbacks and movies (such as Stephen King's *Lawnmower Man*—in which a VR-crazed handyman attempts to take over the world's global telecommunications network), they are enthusiastic about the very real potential of VR in the commercial and industrial worlds.

"Although virtual reality is a technology with few demonstrated commercial applications currently, it has a promising outlook," said James Lipscomb, of IBM's Thomas J. Watson's Research Center in Yorktown Heights, N.Y. Like many VR researchers, however, Lipscomb argues for maintain-

ing perspective about VR's potential, especially relative to other emerging technologies, such as multimedia and highly interactive graphics.

Although VR is closely related to both of these technologies, it is harder to define than either, said Lipscomb. "Virtual reality tries to bring everything together in a compelling immersion experience. You can think of those three technologies as three ink blots that, as they grow to encompass more commercially viable work, will eventually blend together."

So what is virtual reality? Steve Tice, president of SimGraphics Engineering Corp., in South Pasadena, Calif., defines it as "an environment that provides realistic clues to some or all senses sufficient to engender in the user a willing suspension of disbelief." These clues are visual, aural and tactile—you see, hear, touch and otherwise interact with objects in the virtual environment.

You can also think about VR as a way to take complex databases of information and render them—using sophisticated input and output devices—more intuitively understandable by humans in an interactive manner.

The bottom line: Increasingly complex databases of graphical and statistical information could be made more accessible and understandable through virtual reality.

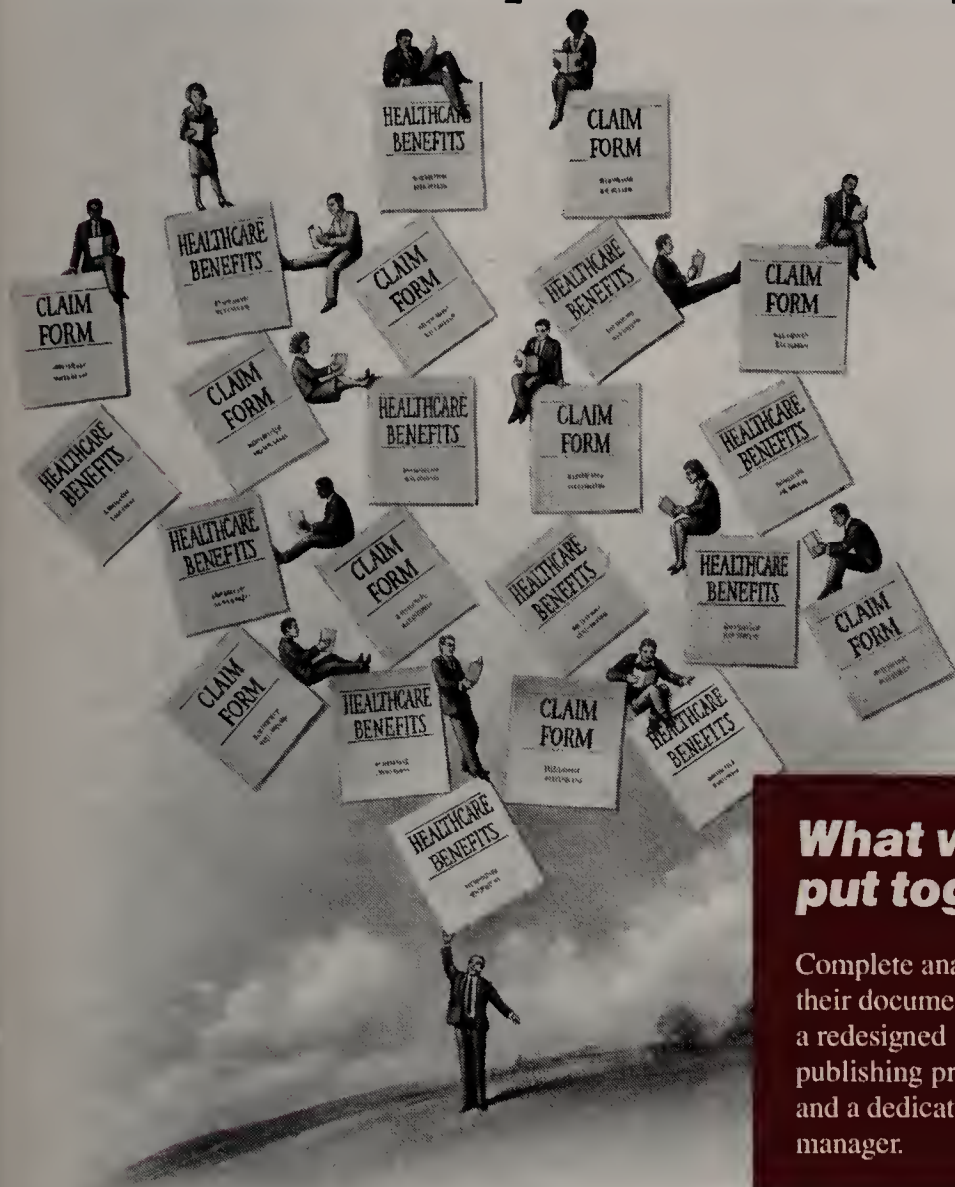
Typically a virtual reality application requires special interface equipment such as a head-mounted display consisting of two color LCD panels that project a stereoscopic image to each eye (sometimes called eye phones). A tracking device correlates head movement with the displayed scene, allowing users to move their heads and view different aspects of the environment. Gloves with sensors attached allow users to actually touch or manipulate objects in the environment.



ILLUSTRATION BY FRED LYNCH

XEROX

They calculated that a 100% increase in business needed a 900% increase in productivity.



What we put together.

Complete analysis of their document needs, a redesigned document publishing process, and a dedicated account manager.

Lynn L. Wells
Document Management Representative



When a major health insurer suddenly doubled its customer base, their MIS department quickly predicted disaster. The company's in-house document publishing system was already overloaded. They had to drastically cut the time it took to produce vital documents or risk the company's reputation for customer service. That's when they called Lynn Wells and the Xerox team.

Working together, they saw that merely upgrading equipment to add capacity was not the solution. So they took a fresh approach and completely redesigned the company's document publishing processes. Carefully building on existing systems, they integrated Xerox workstations, software, scanners and laser printers to create a custom publishing network.

Benefit booklets that once took forty-five days to publish now take less than five, a 900% increase in productivity. MICR-encoded checks and claims explanations are being printed and mailed together, saving \$350,000 a year in postage. And forms are now created electronically, on demand, reducing costs by 30%.

If saving time, money and customers is your idea of a productive partnership, let us help you put it together. Call 1-800-TEAM-XRX, ext. 147G.

Xerox
The Document Company



According to Lipscomb, one critical determination of an application's appropriateness for VR is whether the user needs to interact intimately with objects in the environment. "One of the strongest directions in commercial virtual reality research today is to provide substitutes for experiences in the real world, such as tests for manipulating models or designs that will exist in the natural world when actually built."

One such application already underway is a joint effort between Boeing and the University of Seattle that provides for a "virtual walkthrough" of a computer-aided design of the new Boeing 777 aircraft. "This allows design engineers to make sure the aircraft is ergonomically suitable for humans," said Michael McGreevy, principal engineer of the Human Interface Research Branch of the Aerospace Human Factors Research Division at the NASA Ames Research Center, in Mountain View, Calif. But the line between virtual reality and high-performance graphics systems is rather fuzzy, McGreevy admits.

The key difference: VR allows the user to get inside and be virtually surrounded by the environment and—in the ultimate virtual reality applications—interact with the objects in that environment.

The Boeing example suggests another area of practical usage of VR: architecture. "Clearly, the amount of time spent to actually build an architectural environment—such as a 10-story office building—is significant, and the ability to preview the inside of a building can save tremendous amounts of money," said McGreevy. "This explains why, for Boeing, having the experience of moving through the interior of a design before a prototype aircraft is actually built can be enormously beneficial."

Until recently, the practical architectural applications of VR were limited to walkthroughs where users could look but not touch. But starting last summer, "a Japanese manufacturer allowed homeowners to actually design their own kitchens, then

Increasingly complex databases of graphical and statistical information could be made more accessible and understandable through virtual reality.

virtually walk through them using head-mounted displays," said Lipscomb. The users had the experience of "opening cabinets, turning on water, and getting the general feel of the place."

The next big push in this area will involve studying vehicles while they are still in the design stage, said Lipscomb. This will require a much more sophisticated and rich manipulation environment as dictated by increasingly complex CAD design databases. SimGraphics, a systems integrator, has developed a virtual reality toolkit called VR Workbench, which its clients have used to develop such applications.

For example, the company's Assembly Modeler was developed for Northrop Corp. as part of its Automated Airframe Assembly Program. According to SimGraphics' Tice, this assembly-modeling simulation provides Northrop engineers with the means to concurrently design and plan the parts, tools and manufacturing processes necessary for cost-effective airframe production.

Product visualization is a prime area for development, according to Tice. "If you can provide [people] in the design and manufacturing cycle with their own independent 3-D view of the product, and [then use] audio and telecommunications [to allow them] to actually engage in product and operational analysis, you'll have a much more efficient design cycle."

SimGraphics helped another client, Rockwell International, reduce costs by allowing workers from multiple disciplines to conduct virtual con-

ferences on design specifications. Each person uses a special mouse to manipulate a cursor that has the ability to move behind, in front of and around on-screen objects, as well as to pick up, move and manipulate them. Such an application enables companies to eliminate manufacturing or design costs earlier in the process.

Medical imaging is another area where VR has considerable potential. Specifically, keyhole surgery—in which only a tiny incision is made in order to spur rapid recovery—could be facilitated by VR applications that allow surgeons to make extremely precise movements without having to look at an external monitor, McGreevy said.

Some of the more publicized commercial applications of VR have been developed at VPL Research, in Redwood City, Calif. The company's DataGlove, licensed by Greenleaf Medical Systems in Palo Alto, Calif., is a lycra glove with patented fiber-optic sensors that converts hand movements into computer-readable form.

By collecting data in 3-D space, it and VPL's DataSuit (also licensed by Greenleaf), a customized body suit similarly fitted, allow a computer to track the motion of the person wearing them. Greenleaf uses the Glove and Suit for three separate prototype applications.

The first application, called the Gesture Control System, allows physically impaired individuals who have limited use of their hands and severe speech impairments to perform complicated tasks through simple hand gestures. For example, a prototype Gesture Controlled Switchboard uses the DataGlove and a Macintosh computer to control a telephone-receptionist station. Using hand gestures, the receptionist instructs the computer to answer and route telephone calls, or to activate prerecorded messages to "speak" with the caller.

GloveTalker is another prototype that allows the user to "speak." The wearer of the DataGlove signals to a Macintosh computer with a personalized set of gestures; these are passed to a voice-synthesis system and can be sent over a computer

network or telephone system. "This could be used in hospitals, when a patient in intensive care wakes up and wants to communicate yet is unable to vocalize," said Walter Greenleaf, founder and president of the company. "Using the GloveTalker system, they could make simple gestures that in effect provide them with a spoken vocabulary."

Finally, Greenleaf's Movement Analysis System uses the DataGlove to assess wrist and hand movement, an application particularly useful to

the laboratory, explained a possible application for air-traffic controllers. Wearing a set of eye phones that would allow them to move their heads, controllers could see the position of planes in a three-dimensional world. Barfield called this a vast improvement over current systems, which display information in two dimensions on a computer monitor.

A related application would allow controllers to actually use their eyes to "select" an object in order to receive further information about it.

VR allows the user to get inside and be virtually surrounded by the environment and—in the ultimate virtual reality applications—interact with the objects in that environment.

physical therapists involved in ergonomics analysis and patient rehabilitation.

At the University of Washington in Seattle, one of the top VR research sites in the world, VR studies are being conducted by two separate organizations: the Human Factors Laboratory and the Human Interface Technology (HIT) Laboratory.

The Virtual Worlds Consortium, sponsored by the HIT Laboratory, is a meeting-of-the-minds of academia, industry and government. For \$50,000 a year, organizations receive access to the latest in VR research; they also help guide the R&D agenda of major corporations trying to transfer VR technology into the commercial sector. Current members include Alias Research, Boeing, Digital, Ford, Fujitsu, Microsoft, the Port of Seattle, Sun Microsystems, US WEST Communications and John Fluke Manufacturing.

Meanwhile, researchers at the Human Factors Laboratory are studying interactive computer graphics. Woodrow Barfield, associate professor of engineering and director of

"If your eyes rest on something long enough, you could select an object—a plane, for instance—and hear more-detailed flight or technical data about it than you would otherwise know just by looking at a computer screen," said Barfield. The lab is also researching tactile kinesthetic interfaces to virtual 3-D objects, enabling users not only to see, but also to touch and feel. "Imagine entire body suits that allow your body to feel sensations during interaction with computer-generated objects," he said.

Training will be a key target for this kind of research. "You could design a virtual cockpit and train someone to fly in it much more cheaply than using a simulator," said Barfield.

While the technology for such applications already exists, Barfield pointed out that science and engineering departments are usually years ahead of the commercial market. He said that several corporations are intensely interested in VR, but few expect immediate practical or profitable results. "Most are investing in projects now, realizing that the payoff is a number of

years down the road," he said.

IBM's Lipscomb cautions that the state of VR products today is primitive—especially the low degree of resolution achieved in current head-mounted displays. "It's the great untold story of virtual reality," he said. "The photos you see published that supposedly illustrate the images you would see are actually shot off of high-resolution monitors."

In fact, the image a user actually sees is quite blurred and indistinct, according to Lipscomb. "This makes it rather difficult to design software that does highly detailed manipulations of mind-motor tasks," he said. In addition, he said, the update rate of VR displays (the speed at which the pixels are "refreshed") is slower than for interactive computer graphics; there is a disconcerting "lag time" when users move their heads, and it is difficult for users to judge their position within the VR world. "The whole world around you is jumping back and forth," Lipscomb explained.

Moreover, VR research is very, very expensive. "Virtual reality requires a great deal of money, computational speed and power, and a host of exotic input and output equipment," said Lipscomb. And since the equipment is constantly being improved and updated, researchers are always replacing hardware. "You simply can't afford to skip a generation of products," he said.

Still, VR researchers are not discouraged by such limitations. Nor are they completely alienated by the hype. NASA's McGreevy, for example, finds solace pondering the early days of electricity. The hoopla surrounding the harnessing of that power included road shows with presenters attempting to mystify their audience with a lot of "silly parlor tricks," he said. "And now it's a rather boring utility that is absolutely vital to the way we live. If virtual reality follows the pattern of other hard-to-understand-but-useful technologies—as I believe it will—it will survive the hype." □

Alice LaPlante is a freelance writer based in Palo Alto, Calif.

FYI



A New Recording Angle

In the past, there was no cheap and easy way to create CDs at the desktop, which made the music industry happy but also limited the scope of CD-ROM applications. A new technology coupled with a new software architecture aims to change this situation.

CD-recordable (CD-R) technology gives users the means to inexpensively create CDs. Meridan

Data believes that combining CD-R drives with a software architecture it calls NETSCRIBE will produce an intelligent network peripheral that will create applications for mass storage, publishing and multimedia. NETSCRIBE connects CD-R drives over network topologies such as Ethernet and functions much like a shared printer. Meridan plans to license NETSCRIBE to qualified OEMs and ISVs. To date, the Personal Publisher, which supports the Philips CDD 521 CD-R drive, is available for \$7,995. For more information call 408 438-3100.

Simplicity Amidst Diversity

Developing applications for today's increasingly common distributed, multivendor environments is as much an exercise in communications as in programming. Programmers must learn complex sets of communications rules for each network protocol and then write thousands of lines of protocol-specific code before developing an application that reaches across that network span.

Horizon Strategies has introduced a product that simplifies network management and allows programmers to build business applications rapidly and easily. Message Express is a "middleware" product that lets application designers program for many environments using a single software system, a small set of a rules, and a single programming level. Middleware resides between a business application and the network infrastructure that enables enterprisewide connectivity. Message Express integrates enterprise applications across 12 platforms including CICS, MVS, UNIX, VAX/VMS and OS/2 and supports a range of interaction solutions such as SQL, RPC and file transfer. Prices range from \$595 to \$35,000 per platform. For information call 617 444-7575.

The Image of Organization

Knowledge workers are set in their ways: They have well-honed personal work styles they are loath to abandon, even to accommodate nifty new technologies like document image processing. FileNet Corp. hopes to appease these professionals with its new FolderView software, an imaging add-on that simulates the look, feel and customizable nature of multiple-document folders, right down to the sticky yellow Post-it notes.

FolderView users can customize and rearrange the order of digital documents within folders and group specific documents together, "binding" them with the electronic equivalent of a staple or paper clip. Descriptive icons take the place of tabs, making it easier to locate specific items in a given folder. Several miniature pages can be displayed on-screen simultaneously. Since most workers routinely highlight passages, scribble notes and attach reminders to documents, FolderView simulates these actions as well.

FolderView costs \$795 per workstation. For information call 714 966-3400.

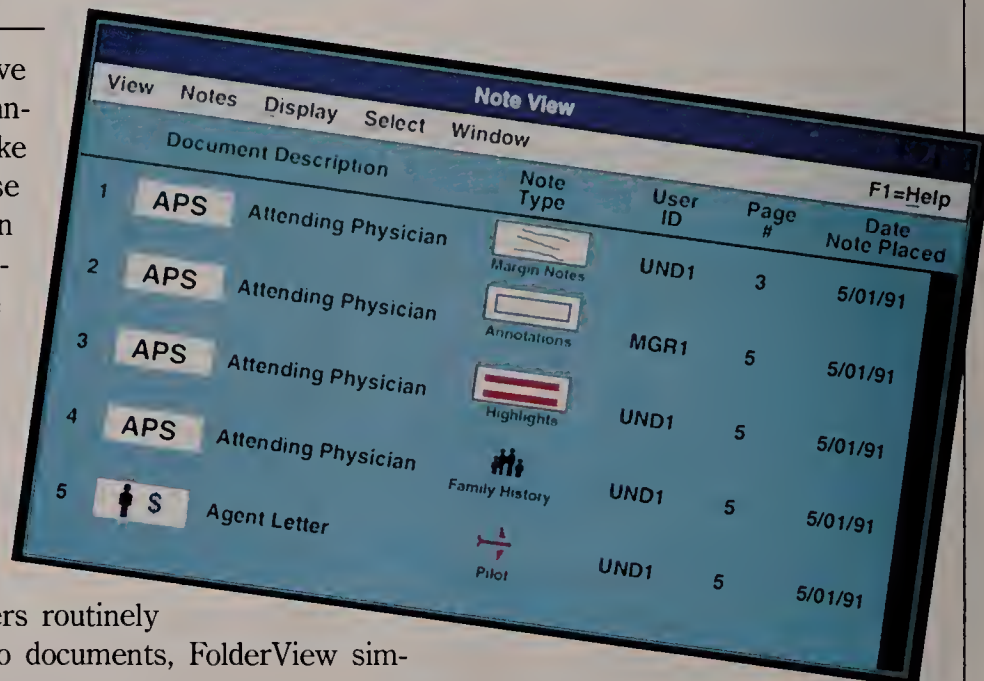
Home Away from Home

Dialing up the office LAN from far-flung locations on the road or from branch offices or home has generally meant sacrificing fully capable interaction with the network. But the rapid proliferation of high-end portable computing has created a large demand for full-function remote LAN access.

Intercomputer Communications Corp. (ICC), of Cincinnati, has released a product that effectively extends full use of the LAN environment to remote users. The product, called RLN (for remote LAN node), resides on a dedicated server that can manage up to 16 remote "client" connections and functions as a network bridge. Remote users dial in and are established as individual network nodes enjoying the same functionality as is available locally.

RLN client software on the server emulates the network interface card. The product incorporates standards that, according to ICC, make it the first remote-access system that is protocol/environment-independent. Data- and protocol-compression techniques increase throughput, helping hold down the cost of remote connections.

Retail pricing of RLN ranges from \$430 for a two-user system to \$6,600 for a 16-user system. For further information call 513 745-0500.





I N D E X

Page numbers refer to the first page of the article(s) in which the company is mentioned. This index is provided as a service to readers. The publisher does not assume any liability for errors or omissions.

Company Index

A.D.A.M. Software	22
AGT Ltd.	66
Amoco Corp.	66
Apple Computer	98
Beyond Inc.	98
Boeing	94
Cincinnati Bell Corp.	66
Compaq	22
Contemporary Books Inc.	100
Crawford & Co.	76
Data General Corp.	98
Digital Equipment Corp.	38, 76, 94
Dow Corning	22
Dun & Bradstreet Software	98

Federal Express	76
First Chicago Corp.	76
Ford	94
Fujitsu	94
General Motors Corp.	32
Greenleaf Medical Systems	94
GTE	76
HIT Laboratory	94
IBM	22, 66, 76, 94
Intel	22
John Fluke Manufacturing	94
Joseph E. Seagram & Sons Inc.	76
Lehigh Press Inc.	76
Microsoft	94
MITRE Corp.	22
NETLAN Inc.	22
Nomadic Technologies	22
Northrop Corp.	94
Norwest Technical Services	
Colorado	90
Oracle Corp.	66
Parsons Technology	22
PPG Industries	76
Proxima Corp.	98
Prudential Private Placement	
Group	38
Rockwell International	94
Search Software America	22
Sears Canada	66
Sense8	22
SimGraphics Engineering Corp.	94
Southern California Gas Co.	66
Sun Microsystems	22, 94

Unisys	22
US WEST Communications	94
USAir	66, 76
VPL Research	94
Westinghouse	76
Xerox Corp.	76

Unisys Corp.	78
Williams Real Estate	C3
XcelleNet Inc.	36
Xerox Corp.	95

Advertiser Index

AT&T	27
AT&T Technologies	4
CIO Publishing Inc.	43, 81
Compaq Computer Corp.	9
Computer Associates Intl. Inc.	2, 65, 92
Data General Corp.	6
Digital Equipment Corp.	C2
Dow Jones Information Services	99
EDS	34
Fujitsu Ltd.	33
GRiD Systems Corp.	41
Hitachi America Ltd.	31
IBM Corp.	72
Information Resources Inc.	75
Informix	C4
Lotus Development Corp.	82
Minolta Corp.	68
NCR Corp.	28
Stratus	62
Sun Microsystems Inc.	86
Texas Instruments Inc.	24

Editorial, Advertising and Business Offices: 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208, (508) 872-8200. **Postal Information:** CIO (ISSN 0894-9301) is published monthly; and semimonthly in April, May, June, September, October and November by CIO Publishing Inc., 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208. Second-class postage paid at Framingham, MA, and at additional mailing offices. **Reprints:** Copyright 1992 by CIO Publishing Inc. All rights reserved. Reproduction of material appearing in CIO is forbidden without written permission. Send all reprint requests to Permissions Editor, CIO, 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208. **Photocopy Rights:** Permission to photocopy for internal or personal use or the internal or personal use of specific clients is granted by CIO for users through the Copyright Clearance Center (CCC), provided that the base fee of \$3.00 per copy of the article, plus \$.50 per page is paid directly to Copyright Clearance Center, 27 Congress Street, Salem, Massachusetts 01970. Please specify: ISSN 0894-9301. Permission to photocopy does not extend to contributed articles followed by this symbol: \$. **Microfilm:** CIO issues and articles can be purchased on 16mm and 35mm microfilm and on 105mm microfiche through University Microfilms International, Serials Acquisitions Department, 300 N. Zeeb Road, Ann Arbor, Michigan 48106. **Subscriptions:** Address subscription inquiries to CIO, 492 Old Connecticut Path, PO Box 9208, Framingham, Massachusetts 01701-9208 or call (800) 788-4605. CIO is distributed free of charge to qualified top information executives. To all others, the one-year basic rate for the U.S. and Canada is \$94. For rates to other countries, please write the publisher. The single copy price is \$7. All subscriptions payable in U.S. funds only. Please allow four to six weeks for new subscriptions to begin. **Change of Address:** Please allow four to six weeks for change of address to take effect. **Postmaster:** Send change of address to CIO, P.O. Box 489, Northbrook, Illinois 60065-9816.



Now there's a true high-performance information system with automatic transmission.

It's called DowVision, and it could make manual information retrieval a thing of the past. Because it brings you the power of the world's premier business and financial news services automatically, and at turbocharged speed.

Based on customized profiles that can be set up for your company, any of its departments or even individual users, DowVision automatically delivers precisely the news your staff needs. Right to their desktops.

News drawn from the Dow Jones news-wires and the full text of *The Wall Street Journal*,

as well as BusinessWire and PR Newswire.

There's a fixed monthly fee that's so affordable, direct access to real-time business news need not be limited to just a few staff members. And DowVision is easily incorporated into your company's enterprise-wide network, or its various LANs.

All of which makes

DowVision the one information service that can automatically enhance your company's performance.

DOWVISIONSM
The lifeblood of business.SM
Another service from Dow Jones Information Services

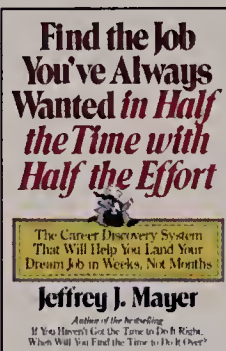
DowVision is a service mark and *The Wall Street Journal* is a registered trademark of Dow Jones & Company, Inc. © 1992 Dow Jones & Company, Inc. All Rights Reserved

OFF THE SHELF

FIND THE JOB YOU'VE ALWAYS WANTED

in *Half the Time with Half the Effort*

By Jeffrey J. Mayer
Contemporary Books Inc.
(Chicago), 1992
160 pages, \$16.95



Hunting for a job is like hunting elephant: There aren't a whole lot of them out there, so you've got to know what you're doing. In his none-too-pithily titled new book, *Find the Job You've Always Wanted in Half the Time with Half the Effort*, author Jeffrey Mayer shows readers how to use organization, time-management, self-promotion and motivation in the quest for employment. And while he isn't really promising to make the

experience 50 percent less hellish, his ideas may at least speed things up by showing readers how to conduct a smarter search.

"Time is the most valuable asset you have," writes Mayer, and job hunting requires lots of it. But people can invest weeks or months, as well as considerable money and effort, in the pursuit and still not get any results. Some blame it on the market, but Mayer argues that these unfortunates fail because they don't know precisely what they're looking for, or because they use ineffective methods.

Mayer's book offers no magic formula for finding a job. It covers the usual territory, but it has the extra benefit of the author's focused, results-oriented approach. His "Career Discovery System," for example, is a series of self-assessment exercises to help job hunters define their goals before beginning the search.

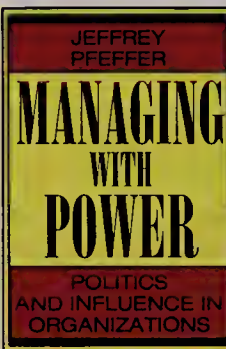
The book is full of practical advice, such as techniques for finding and contacting the people most likely to advance the reader's cause. And Mayer makes a valiant effort to inject humor into an inherently stressful subject. (If someone is rude or obnoxious, he quips, "get off the phone as quickly as possible, and be happy you don't work there.") Throughout he emphasizes preparation and "practice, practice, practice."

Mayer writes like a coach—with lots of instructions. His book is clear and well organized, which is a good thing, since most of his audience will be too busy updating resumes and making those crucial calls to devote much time to reading. Its suggestions should prove equally valuable to inexperienced job hunters, old pros looking for new tricks, and anyone currently bogged down in the process who feels in need of a recharge.

MANAGING WITH POWER

Politics and Influence in Organizations

By Jeffrey Pfeffer
Harvard Business School Press
(Boston), 1992
400 pages, \$24.95



Power is a matter of who you know, what you know and what you do with what you know, according to Stanford Prof. Jeffrey Pfeffer. But *Managing with Power* is less about scaling the corporate ladder than about getting your way no matter what rung you happen to be on. Pfeffer defines power as "the potential ability to influence behavior, to change the course of events, to overcome resistance, and to get people to do things that they would not otherwise do." His book should appeal to anyone bursting with good ideas but lacking the authority to implement them.

Pfeffer starts off with a general discussion of how power operates within the organization. Recognizing that "knowledge of the power dis-

tribution is itself an important form of power," he explains how to read the political situation in a given organization based on clues as diverse as who benefits from decisions and whose office has carpeting.

In his examination of the sources of power, Pfeffer attributes the ability to garner allies and to survive in the competitive arena to personal traits such as energy and sensitivity. But he stresses that situational factors—including control over resources, ties to powerful others and position in the hierarchy—are more important. "Although individual attributes are important, my view is that being in the right place is more essential," he writes.

The emphasis switches from organizational politics to social psychology in a section on the use of power. Pfeffer's aim is to sensitize readers to the basic processes of "interpersonal influence" and then arm them with strategies that apply that understanding to the exercise of power. These strategies involve the use of timing, structural changes, information, analysis and even language, ceremony and setting to "influence the heart as well as the head."

Pfeffer peppers his book with anecdotes of power both seized and squandered. Among his recurring cast of characters are LBJ; Henry Kissinger ("a master at exercising power through intervention in the structure"); and especially Robert Moses, a former New York parks commissioner whose "genius was seeing the opportunity to control the expenditures of enormous sums of money through parks, roads and bridges, and in using these development resources to obtain a degree of power almost unparalleled in public life."

Managing with Power concludes with a reiteration of the message that power is about getting things done in organizations. Pfeffer reminds the reader that managing power is at least as important as managing with power, and that power dynamics can be nonproductive—or even harmful—to an organization. Still, in the real world, catastrophes will be averted, innovative products introduced and technology optimized only if the right person has the ability to get things done. "Perhaps there is a greater sin than making a mistake or influencing others," Pfeffer concludes: "the sin of doing nothing."

INFORMATION POWERHOUSE



Briarcliff Manor in Westchester County, New York, formerly a **FORTUNE 500 DATA CENTER** offers **36,000 square feet** of technologically advanced space in a secure, contemporary setting.

Located in New York's prestigious "blue chip" corridor, this state-of-the-art facility is just 40 minutes from New York City and easily accessible to all major thruways.

FORTUNE 500 FEATURES:

- * UPS power and emergency generators
- * Fiber optics capability, T-1 circuitry and numerous twisted-pair telephone lines
- * Over 400 tons of chiller water capacity



WILLIAMS
Corporate Real Estate Advisors

For further information, please call:

Brian Given (212) 704-3518 Deborah van der Heyden (212) 704-3760

Informix Database Technology Helps DHL Deliver "Faster To More Of The World."



When DHL Worldwide Express® wanted to speed up the movement of thousands of packages through customs and improve customer service, they turned to us, Informix, the experts in UNIX® relational database management systems.

Worldwide Distributed Package Tracking System.

DHL required a system that would track packages on thousands of flights to over a half million customers around the globe. They needed a database that would stand up to the corresponding large amounts of data and high volume of activity, and they needed to make it available to virtually every DHL office worldwide.

DHL chose Informix's UNIX solution.

Speeding Information Through a Global Network.

DHL used Informix's application development tools and OLTP server technology to develop and run *Track and Trace*. This transaction-intensive application complements DHL's other systems and enables employees to better serve customers by quickly determining package locations and expected arrival times.

DHL Worldwide Express and thousands of other companies have called on us for 12 years to successfully handle their critical data.

If you're considering UNIX for data management, talk to Informix. Because we're the experts.

Call 1-800-688-IFMX.



THE UNIX DATABASE EXPERTS.